OCTOBER 1957

Skyways

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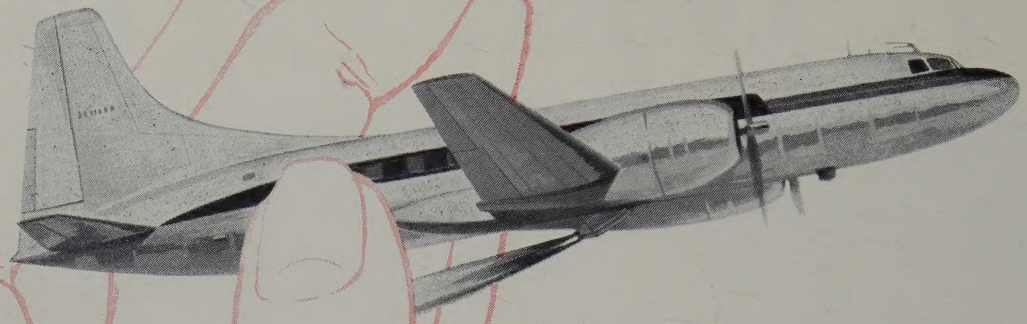
CONVENTION ISSUE

Official Publication National Business Aircraft Association



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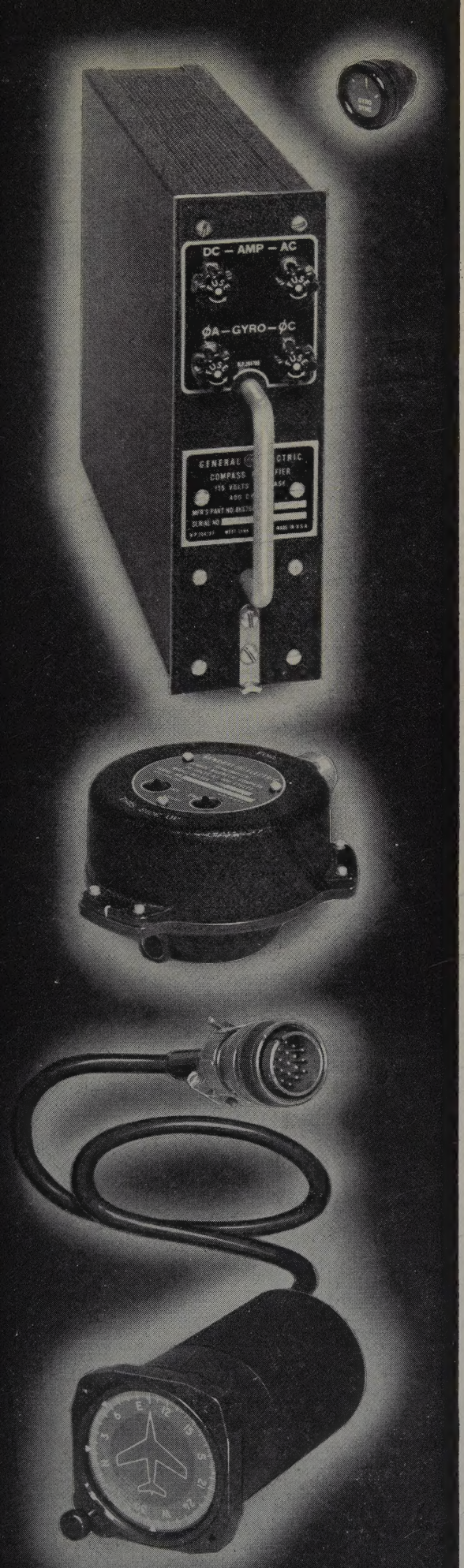

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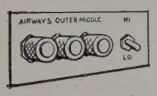

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OCTOBER, 1957

Skyways FOR BUSINESS

The official publication of the National Business Aircraft Association

COVER: The specially designed cover for National Business Aircraft Association's convention issue is a Denver motif represented by Stapleton Air Field's runway pattern with mountains to the west. The art was done by Donald G. Carter of Denver.

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MILITARY DOMINATION

NBAA's Special Report of July 29, 1957 brings into public focus a subject of vital importance to all citizens of the United States and particularly to all segments of civil aviation.

The subject is not new: it involves Military domination of the public domain.

Throughout the history of our country there has been, and should continue to be, understandable reluctance on the part of any patriotic civilian to criticize military action designed for defense. However, our history as a people records many instances where civilians of necessity sought and have been granted relief from Military domination.

In order to move its troops and supplies the Military does not have to run and operate the railroads. The public highways are civilian controlled and capable of serving military needs without Military domination. Our seaways, our harbors, and our rivers serve both civilian and military requirements and, in time of peace, are in civilian hands.

NBBA's Special Report of July 27, 1957 has an opening paragraph, "A major struggle for control of the airspace is developing between civil and military aviation." That struggle has developed because the Military is trying to relegate civil aviation to areas insufficient for its needs. It seems to have developed because the Military has thus far been unwilling to fully cooperate with the overall needs of all facets of our society; because of the Military's incessant demand for large portions of the airspace for exclusive military use.

The Civil Aeronautics Act of 1938 states:

> "There is hereby recognized and declared to exist in behalf of any citizen of the United States, a public right of freedom of transit in air commerce through the navigable airspace of the United States."

Actually, since our fervent preparations for World War II there has been a growing military encroachment upon the freedom of transit of many citizens through the navigable airspace of our country. Such encroachment as may be required in the defense of our country is tenable; any other encroachment is not.

The very concept and the foundation of our country's freedom is based upon three branches of government—the Legislative, the Judicial, and the Executive. All three of these branches are civilian. In times of peace it does not therefore seem to be in the public interest to permit the Military to *bypass* air traffic regulations and be able to *nullify* established civilian statutory authority.

It is not necessary nor is it properly in the public interest that a military truck or automobile should be permitted to ignore red lights on our streets and highways. Likewise, it is not necessary nor is it in the public interest for a military airplane to ignore established procedures for air traffic control.

Few citizens of our country outside the ranks of professional pilots have any idea of the encroachment the Military has made upon the airspace of these United States. Our air maps are covered with "Caution" areas, with "Warning" areas, with "Danger" areas, with "Prohibited" areas, and with "Air Defense Identification Zones." Furthermore, to make matters worse there are numerous military aircraft in our skies which do not have the necessary equipment aboard, under weather conditions, required to make positive fixes in the airspace and to comply with air regulations.

To fly in these United States any more means to follow a circuitous route rather than a straight line. The civilian pilot who should be attending to his important duties of properly controlling his airplane and to keeping alert for other traffic, is forced to become a research specialist and give almost constant attention to his charts, his manuals, and his maps in order to be sure and not violate military "requirements." As one illustration, on the short trip from Washington to New York, or vice versa, a civilian airplane has to go a distance twenty-eight per cent longer than is necessary in order to accommodate the Military.

President Eisenhower has very recently signed legislation providing for the establishment of an Airways Modernization Board. In theory, this Board is to do a groundbreaking job and to lay the foundation for a new "Federal Aviation Agency." In theory, the Airways Modernization Board and the Federal Aviation Agency will be civilian controlled, although the Airways Modernization Board will have as its first head Lt. General Elwood Quesada. For the next two or three years General Quesada faces an acid test. The test of being able to make objective decisions despite his military ties; the test of seeing that the law of the land is impartially enforced and that the air ocean of these United States is brought back to the status of a *public domain* wherein "any citizen of the United States has a public right of freedom of transit in the navigable airspace of the United States."

The stand of NBAA deserves the support of all freedom loving citizens.

Announcing a new extra service for Cessna owners

Now—if you request—Cessna will notify you *directly* when a Service Letter applicable to your airplane is sent to your Cessna dealer!

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AIR YOUR VIEWS

Dear Editor:

The "Know Your Thunderstorms" item which appeared on page 20 of the August 1957 issue of Skyways was read with considerable interest. I cannot, however, concur with your pointer No. 3 which states, "Greatest turbulence at all levels is associated with highest water concentrations."

The work by American Airlines for the Navy in their weather radar program established the fact that the heaviest turbulence is normally associated with the steepest rainfall gradients; i.e., proximity to the areas of most rapid change in precipitation rate or stated another way where the change from no rain to heavy rain occurred in a short distance. This finding lead Frank C. White to develop a workable Isoecho contour circuit during the American Airline tests so that the contours of two rates of rainfall could be displayed simultaneously.

It is the Isoecho display that permits the pilot to determine which corridors are safe to fly through in squall lines or large storm areas where many storm cells are closely grouped. Furthermore it identifies which portions of a storm cell have the heaviest and lightest turbulence associated with them. Many times during the United tests smooth passes were made through heavy rainfall portions of storm cells where the rainfall gradient was shallow.

The subject was covered in some detail in my paper on "Application of Airborne Radar to Airline Operations" which appeared in the January 1955 issue of Skyways.

E. A. Post, Mgr.
Radio Systems Laboratory

Dear Mr. Post:

We were delighted to discover that you had read our Newsletter item "Know Your Thunderstorms" and had found it sufficiently interesting to merit your comment.

Your contention that "heaviest turbulance is normally associated with the steepest rainfall gradients" rather than highest water concentrations, is absolutely correct.

Thank you for your constructive comment.

Sincerely,
Louis Achitoff
Vice President, Operations

Dear Editor:

Please advise Torch Lewis that I agree with his article in the July issue of Skyways, Greenhouse Patter, about the Charleston, W. Va., Airport.

But in as much as we go into Charleston about twice a week under all conditions, I disagree that the airport is the highest point around. There are hills up to 300 feet within a mile of the airport. The minimum altitude over the middle marker for an ILS approach is 500 above the field, and the marker is ½ mile from the runway.

Using this airport requires caution under any condition. Ask any pilot who uses it frequently, either airline or executive.

Executive Pilot

Editor:

"Executive Pilot" is on the beam. I should have said "one of the highest points around." Besides which an IFR approach should be made with caution ANYPLACE.

Torch

To the Editor:

I have just finished reading your article on "High Density Safety," and as a persistent advocate of mono-directional airports, I found your comments on cross wind operations of particular interest.

However, you mention quadrantial separation and one-way airways and I would like to have your comments on a separation system I proposed some years ago.

In place of the fantastic network of airways which we now have I proposed a helical relationship between air pressure and compass course with each airplane equipped with a factory-calibrated air pressure gauge not subject to setting by the pilot and having a scale which was a compass rose. The indicator would then tell the pilot what direction he should be flying at that pressure altitude.

An instrument of this kind was developed for CAA and consisted essentially of a sensitive altimeter in which the sensitive needle made one revolution in 2000' instead of 1000'. It was tried out by some of the airlines and the military but abandoned because the military objected to another instrument.

J. H. Geisse

Gentlemen:

Reference is made to the subject INTERMEDIATE LANDING FIELDS, page 56, Skyways for August 1957.

I wish to advise that in June of 1957 I had occasion to use the intermediate CAA field at Eagle, Colorado. Flying east over this high airway, I was caught between two severe mountain thunderstorms. Fred Baker, the CAA operator, made a routine call to check my position and to advise that I was boxed in, although Eagle field and I were both in clear air. An emergency landing was made at the CAA field, and the storm was waited out until the following morning.

I m tor retaining these fields intact throughout the nation. As rough as they are, they shouldn't cost much to maintain.

Yours very truly,
BARTON CAROTHERS

Dear Editor:

The article "Certain Contraindications to Flight" (August) by Dr. Russell J. Vastine, Jr., was very interesting.

If you have no objection, we would like to circulate copies of this article to personnel in this organization who travel via company plane.

Yours very truly,
A. W. Stewart
Director of Transportation
Columbia Gas System Service Corp.

To the Editor:

I keep thinking of your February editorial re a Civil Air Show. My answer continues to be an emphatic YES!

I have always maintained that the public should be informed of what Civil Aviation is doing, the safety of "small" planes, and I have tried without much success to get the NJPA, CJPA, and many other groups to release to the newspapers, radio, etc., a true account.

I think the TV film made of the Westchester Co. demonstrations were most convincing, especially shutting the engine off and gliding down. On a recent airlines trip I asked many passengers if they had been up in a small plane—negative and confused answers were my lot.

Keep up the good work along these lines. I'm sure other pilot groups will back you.

Donald V. N. Conover

NBAA Director's Notes *Suite 344*

Announcement of Beech's turbo-prop Model 112 wasn't exactly as Beech had planned it. As a matter of fact it was so premature that conversation with Beech's representative on the day first public mention was made only elicited the comment, "Egad . . . how did that get out?"

Most logical guess indicates that Beech's advisory notice to CAA got "leaked."

Preliminary design information on the Model 112 will be given first official public utterance at NBAA's Turbo-Prop panel in Denver on October 4th.

* * * * *

AMB—Airways Modernization Board—now in table-of-organization formation throes. E. R. Quesada, wearing two command hats as Chairman of the AMB as well as Presidential Aviation Advisor, and his staff are working hard at it. General aviation, according to plans, will have important voice. Selection of qualified general aviation representatives for full-time Washington duty is a major problem.

* * * * *

NBAA is encouraging CAA to continue their runway lighting evaluation program. Andrews AFB tests this Spring were inconclusive, NBAA has pointed out to CAA, in that general aviation type aircraft were not used in actual test program. Airline equipment and DC-3s ran the tests, but no "light-twin" categories were used. Cockpit height off the ground can vary from 6 feet to 18 feet—and the angle of runway light projection can be ideal for the Convairs, and DC-7s and entirely obnoxious to those in a twin-Beech or Aero Commander. Combination of eyebrow lighting—which illuminates runway plus runway centerline high intensity lights for guidance, roll-out and for missed approaches may be a better answer than presently airline-pilot-favored Elfaka system.

* * * * *

Piper's "Open-House" Party had more than 650 light aircraft land in less than 5 hours on one runway—probably one of the greatest concentrations of aircraft in that space of time ever to be recorded in aviation history. No control tower, no ILS, no VOLSCAN, no data link, no computers—just darned good flying with the law of averages apparently repealed. Congratulations to Mr. Bill Piper, Sr. and all the fine Piper-people on the roll out of their 45,000th aircraft!

* * * * *

Current Washingtonia: It is said that the first order that General Curtis LeMay, former SAC Commander, issued on his new Pentagon tour was to raise all wash-stands three feet—he wants everyone on their toes!

* * * * *

Military aviation officials rebuffed by the White House in their attempt to thwart the CAB's proposal authorizing the CAA Administrator to waive compliance with air traffic rules and to designate restricted areas, are mustering their forces for an all-out fight to maintain the present "status quo" which permits them to easily avoid compliance with air traffic rules and regulations.

CAB has extended for 30 days the period for receiving comments on Draft Release 57-16A which makes the amendments—in order to allow the Department of Defense to prepare for the new October 3rd deadline.

The following were all welcome visitors of National Headquarters during August: Ed Binder, pilots Employment Agency; John Bouteller, Service Pipe Line Co.; Stan Smith, New York Wire Cloth; Don Webber, Texas Illinois Natural Gas Pipe Line Co.; Harley Kysor, Aeronautical Consultants & Associates, Inc., L. L. Swartz, Bendix Products Div., Bendix Aviation Corp., Al Ueltschi, Flight Safety, Inc.

On behalf of the membership and the Board of Directors, NBAA welcomes the following new members.

THE CHEMSTRAND CORP., Decatur, Ala., Manufacturer of Synthetic Fibers, operating Lockheed Lodestar and Beechcraft D-18-S. Robert F. Hinds, Chief Pilot is NBAA Representative; James Vandervort, Asst. to the President is in charge of aviation activities.

WATERMAN STEAMSHIP CORP., Mobile, Ala., operating Lockheed Learstar and Lockheed Lodestar, W. C. Correll, Chief Pilot is NBAA Representative, C. W. McLean, Executive Asst. is in charge of aviation activities.

BUCKEYE PIPE LINE CO., N.Y., N.Y., transportation of crude oils and products by pipe line, operating Beechcraft D-18-S and Piper PA 18s. B. B. Shoup, Chief Pilot is NBAA Representative and G. A. Patterson President, is in charge of aviation activities.

McCULLOCH MOTORS CORP., Los Angeles, Calif., manufacturer of 2-cycle gasoline engines, operating Beechcraft E-18-S. C. Fred Breer, Vice President, Sales, is NBAA Representative and Jim Dyerly is Chief Pilot.

INTERNATIONAL BREWERIES, INC., Detroit, Mich., brewing and distribution of beer and ale, operating Beech E-18-S and Beech Bonanza. Bruce Berckmans, President is NAA Representative and Ray W. June is Chief Pilot.

THE HOLLISTON MILLS, INC., Hanover, Mass., manufacturers of bookbinding cloths, operating Douglas DC-3, John Briggs, Chief Pilot is NBAA Representative.

AERONAUTICAL CONSULTANTS AND ASSOC., INC., N.Y., N.Y., technical advisors and research analysts to business aviation. Harley D. Kysor, President is NBAA Representative.

MAILINGS FOR THE MONTH: Maintenance Bulletin #1; Tenth Annual Meeting and Forum Tentative Program, Housing Form; Reminder of NBAA Annual Safety Award Applications for 1957; Advance Registration Forms; Notice of Annual Meeting, Proxy Statement and Proxy; Proposed Airworthiness Directives on the Viscount, Piper and DeHavilland 104.

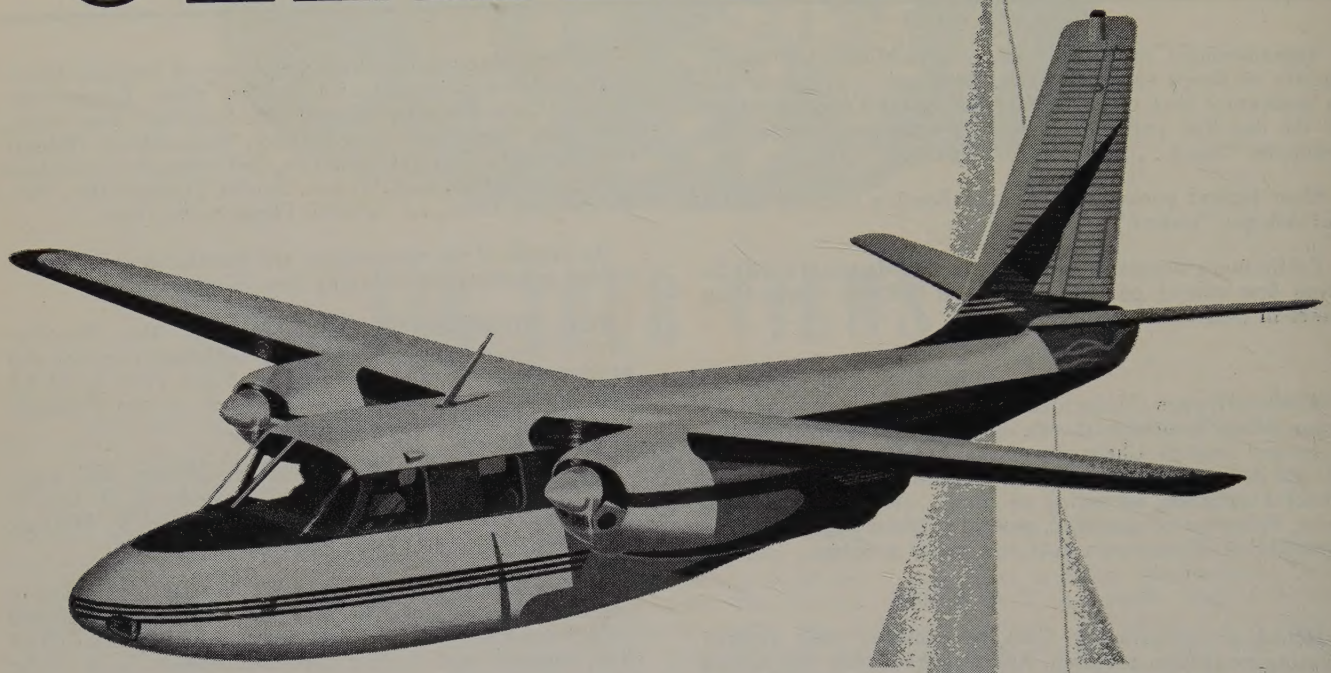
Bill Lawton, Dick Groux and I look forward to seeing "you all" in Denver. If you have any questions or require any information please contact us at the Cosmopolitan Hotel.

* * * * *

What more appropriate city could be named for an aviation meeting than Denver—The Mile High City with the Mile High Center. What, no club?

"C. M."

time: a vital corporate asset



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Visit the Aero Commander booths 212 and 213 at the NBAA CONVENTION.

now hear this...

Martin J. Caserio has been appointed manager of Milwaukee operations of AC Spark Plug division of General Motors. He succeeds **Warren E. Milner,** now general manager of the Hyatt Bearings division, Harrison, N.J.

Succeeding Caserio as director of engineering and equipment sales for the Flint plants is **Glen R. Fitzgerald,** formerly chief engineer, automotive products. Fitzgerald is succeeded by **Leo W. Tobin, Jr.,** formerly acting resident engineer for AC-Milwaukee.

Philip D. Terry, formerly with William R. Whitaker Aircraft Valve Co., has joined Western Gear Corp. as regional marketing manager of aircraft and missiles products for the eastern area.

Whitney Collins, will join Solar Aircraft Company as executive assistant to the president. Prior to joining Solar, Collins was associated with Continental Aviation and Engineering Co.

A. E. Felt has been appointed chief production engineer to supervise orders for jet parts and missile components at the Aeronautical Division of A. O. Smith Corp., Milwaukee.

Vernon L. Hagg has joined Farnsworth Electronics Co., Ft. Wayne, Ind., as vice-president in charge of missile test equipment. He was vice-president in charge of operations at Gray Manufacturing Corp.

Thomas Wolfe, board chairman and president of Pacific Airmotive Corp., has resigned to form Thomas Wolfe & Associates, management, marketing and government relations specialists serving the aviation industry. Office is in Los Angeles.

Edward P. Curtis, Eastman Kodak Co. vice-president and former special assistant to President Eisenhower for aviation facilities planning, was honored as "Mr. OX-5 of 1957" at the club's annual convention.

Aubrey Keif, manager of aviation for the Texas Co., has accepted chairmanship of the air lines division of the Travelers Aid Society of New York's annual fund drive.

Lester G. Becher has been appointed eastern sales manager for aircraft and ordnance of the Weatherhead Co., Cleveland. He will be headquartered in Wayne, Pa. He has been a marketing engineer for GE.

Edward L. Carlson, advertising manager of Oakite Products, Inc., NYC, has been placed in charge of information services in the industrial cleaning and metal finishing fields.

R. E. "Tim" Dahlin, Dallas, has been named sales and engineering service agent for the southwest territory of Fastex division of Illinois Tool Works. Fastex produces aircraft and missile fasteners.

B. V. Deltour has been appointed sales manager for the Federal Autopilot line of the Industrial Products division of IT&T.

Edgar N. Smith, recently administrator of CAA's sixth region, Honolulu, has been appointed chief of the planning division of the CAA Office of Airports. Other CAA appointments include Karl Voelter, security officer, to general aviation adviser in the General Safety division.

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Aerodex, the world's most modern commercial engine overhaul facility, serves the engine overhaul needs of 14 domestic and foreign Air Lines. These major commercial Air Lines have proven over the years that the Aerodex slogan "QUALITY PRODUCTS . . . ON SCHEDULE . . . AT A FAIR PRICE" is not just an idle phrase but a statement of provable fact. Fully automatic material handling plus highly skilled specialists, the most modern equipment and finest materials available are the reasons for Aerodex leadership in the engine overhaul field . . . year after year.

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P. O. BOX 123, INTERNATIONAL AIRPORT BRANCH • MIAMI 48, FLORIDA

A DECADE OF PROGRESS

A decade is but a flash in the history of time but it is sufficient to spot and to measure many human accomplishments.

A little more than ten years have passed since NBAA (then Corporate Aircraft Owners Association) first organized. Only a handful of men were present at the first Forum in Washington, D. C., August 11, 1948. Some of their names are known and they include Eugene T. Spetnagle, Wolfe Industries; R. W. Richardson, Goodyear Tire and Rubber Company; Walt C. Pague, ARMCO Steel Corporation; John R. Dunham, United Cigar Stores; T. Wilson Hotz, Reynolds Metal; James G. Guess, Burlington Mills; W. B. Belden, Republic Steel; T. J. Lathrop, Bristol Myers, Inc.; Paul Craig, Champion Paper and Fiber Company; D. S. Bixler, Sinclair Refining Company; and, J. B. Mitchell, Howes Brothers Company.

Bill Belden, Counselor for Republic Steel and J. Fred Henry, Publisher of Skyways, took initial leadership by forcefully backing the idea that firms using aircraft in the conduct of their business should associate in order to exchange ideas, solve common problems and protect their collective interests.

The decade that has passed since that first NBAA Forum has witnessed an undreamed of growth in the use of business aircraft; from a few hundred to more than 23,500!

Many benefits accruing from industrial aircraft use could be touched upon but it should suffice to point out what is considered the outstanding one: *The growth of American prosperity since World War II has been proportioned to the growing use of aircraft.* Aircraft should be credited with materially aiding in the decentralization of our Country's industries.

Only with airplanes could industry so quickly and so economically decentralize to its present stage. This decentralization has helped in multiplying jobs, in increasing productivity and in lowering unit costs. Airplanes have done so by efficiently enmeshing raw materials, production and marketing.

Trade, production and the turnover of materials by American business firms constitute the real source of wealth in our Country. During these last ten years the airplane has played a part in making it possible to produce and to trade on a scale never before known; sufficiently so to satisfy the growing needs of our increasing population, not to mention vast areas of the free world.

The airplane has been of considerable importance in this expansion because of its ability to conserve time and dwarf distance.

And time and distance have always been limiting factors in social progress.

The Nationally Business Aircraft Association, through the weeks and months and years that have gone by since that first Forum in Washington in 1948, has more than kept pace with the evolutionary progress of the times. It has become a respected counsel to our Government, it has opposed bad laws and espoused good ones that affect aviation nationally and internationally. It has taken its place in helping to make aviation safer and in expanding the areas of aircraft utilization.

NBAA has not earned its present stature by representing any selfish interests but rather by working for the whole of civil aviation, full well believing that whatever is good for all civil aviation is also good for the business segment of it.

NBAA's Tenth Annual Forum at Denver on October 2, 3, and 4, 1957 will be a testimonial to the selfless works of the Staff, to all who have contributed of time, energy and talent, particularly to the leadership of Bill Belden who served as President from 1948 to 1952, to Cole Morrow who served from 1952 to 1954, to Henry Boggess who served from 1954 to 1957 and to Joe Burns who now holds that office. These leaders, their Boards of Directors, and many others who have given so freely, deserve the benediction of "Thanks, and well done."

NBAA Membership

Information regarding regular or Associate Membership in the National Business Aircraft Association is readily secured by writing to the Executive Director and Secretary of NBAA at 344 Pennsylvania Building, Washington 4, D.C.

Membership in this non-profit and independent aviation organization is based on the recognition of business flying problems common to all users of aircraft for their business purposes and to those engaged in supporting the operation, servicing, equipment, and manufacture of business aircraft.

Among the fields in which NBAA is concerned are: improvements in airways and airports, better weather service, expansion in communications and air navigation facilities, higher standards of airport services, improved aircraft parts distribution, equitable tax rulings for business aircraft operations, greater recognition of the airplane as a necessary tool in modern business and industry, better air traffic control procedures, professional status for qualified business pilots, and aircraft designed to meet the special requirements of business flying.

CORBIN DOUGLASS *is chairman of the Convention arrangements committee.*

PAUL A BERGREN *is chairman of the exhibits committee for the Denver convention.*

The considerable time and energy contributed by the Denver arrangements committee headed by *Corbin Douglass* has been instrumental in providing facilities for a highly successful 1957 NBAA convention.

Members of the committee took valuable time from their important work schedules to assure solid arrangements for members of NBAA deluging Denver.

Ably assisting "Corby" was *Paul A. Bergren* of Clinton Aviation, Cessna distributor in Denver, and former operator of Beacon Strip Aero Sales.

"Corby" is a veteran pilot (since 1937) who is now president of his own insurance firm which does "as large an aviation insurance volume of business as any other agency in the country." His activities also extend to the presidencies of Empire Air Service, Inc., and Lord & Moore Co., both of which are concerned with the rental of airplanes.

Others on the committee include *Harry G. Anderson,* NBAA veep, and vice-president of The Denver National Bank. *Louis L. Clinton, Jr.,* is founder of the Clinton Aviation Co. which provides primary instrument training for United Airlines.

Bruce M. Jacobson, committee vice-chairman, is sales representative for United Airlines and an Air Force veteran of WW II and Korea.

Another Clinton Aviation staffer on the committee is *Kenneth Jones,* manager of sales and charter for the company. *G. S. Kitchen,* a U. of Wyo. graduate, is with Frontier Airlines. He had been cargo sales and sales promotion manager of Continental Airlines.

In charge of entertainment for the convention is *Lou Morgan,* owner and operator of Lou Morgan Music and musical director of the Brown Palace Hotel in Denver.

William A. Prescott, who held the unofficial U. S. soaring endurance record at 18 (1935), is manager of general aviation sales at Jeppesen & Co.

Helicopter, Inc. president *Hersey W. Young Jr.* is also on the roster.

NBAA CONVENTION COMMITTEE *chairmen and co-workers at Denver. Back row from left: Wm. E. Thacker, housing; Hersey W. Young Jr., helicopter transportation; Les Hall and Ken Jones, aircraft parking and services; Herman C. Gassert and Bruce Jacobson, transportation. Front row from left: Bill Prescott, welcome and host; Dick Martin, transportation; Corky Douglass, chairman; Lou Morgan, entertainment; Harry Anderson, finance. Not shown are Louis L. Clinton and G. S. Kitchen.*

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IN AIRLINE SERVICE

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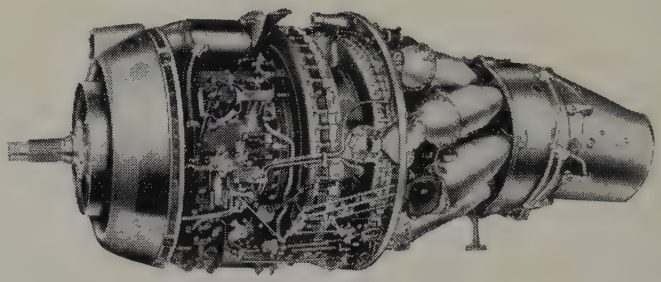

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Many corporations have decided that the F-27 is the aircraft to modernize their fleets. Cruising at better than 300 mph over a 2100-mile range, the F-27 surrounds airborne executives with pressurized and air conditioned comfort. And no other aircraft of its type has the F-27's short-field capability.

For full information write to: R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine & Airplane Corporation, Hagerstown 15, Maryland.

THE FINEST AIRCRAFT FOR AIRLINES, CORPORATIONS AND MILITARY SERVICES

45,000th plane
PIPER'S HOLIDAY

The "Grand Ol' Man" of business and civil aviation had a holiday at Lock Haven recently. More than 4,000 friends and neighbors gathered to share with him the tribute he earned by producing his 45,000th airplane, to set a new world record for civilian aircraft production.

One of the biggest thrills of the day-long celebration was the sight of more than 650 airplanes landing eight a minute during the period just before noon, August 17. The 2,300 fly-in guests came from as far away as El Paso, Texas, and Miami, Fla. They included pilots, business men, Piper dealers, newsmen and magazine writers, who were helping W. T. Piper, Sr., celebrate almost three decades of dedicated service to American aviation.

With the long-time exponent of safe flying, the guests expressed their gratification of the great skill with which the pilots of aircraft, ranging from *J-3's* to *Aero Commanders* spaced themselves in the pattern to permit an orderly flow of traffic onto the 3,350-foot east-west runway.

Advisory radio service was provided by Unicom (122.8), but because of the high density, individual landing instructions were not possible.

By shortly after noon, the entire 200 acres of Lock Haven airport were completely covered with aircraft, leaving clear only the runway and adjacent ground. One line of more than 50 visiting twin-engine Piper *Apaches* extended more than 3,000 feet from one end of the airport to the other.

During ceremonies when he received the keys of the 45,000th Piper production, *Apache* N3196P reserved for his personal use, Mr. Piper said he "had no idea that we'd ever see a day like this," referring to the record-breaking number of airplanes and people at Lock Haven for the day.

Feature of the noontime festivities was when Mr. Piper cut into a huge cake with a six-foot cutlass, made of aluminum in the Piper plant especially for the occasion. At his side were his three sons, W. T., Jr., Thomas F. and Howard, all vice-presidents of the company.

First piece of cake was presented to Mrs. Piper, Sr.; the second to Warren Finch, 28-year-employee, who is with Piper's Experimental department.

Mr. Piper told the more than 2,500 luncheon guests of the development of the business airplane, pointing out the rapid strides which have been made in the current crop of private aircraft with far greater utility, speed, range and capacity. He concluded with high praise for CAA's greatly-improved navigation facilities "which keep us from getting lost."

During the day, the Piper plant adjacent to the airport was open for inspection by more than 4,000 persons. Mr. Piper himself guided several groups through the plant, located adjacent to Lock Haven Municipal airport, known for many years as "Cob Haven," a fitting tribute to the lightplane by which many of the prominent names in aviation today were introduced to flying.

The 10-acre, 20-year-old site has recently been expanded to 423,000 sq. ft. of factory space to produce more commercial-type aircraft than have been built in any other plant in the world.

Piper's history dates back to 1928, when the predecessor company built the Taylor *Chummy* in Rochester, N. Y. In 1929, the original *Cub* was named, inspired by the Brownback Kitten, a 20 hp, 2-cyl., 2-stroke engine which powered it.

Piper Aircraft became the present organization in Bradford, Pa., in 1935, moving in 1937 to Lock Haven, when fire destroyed the original plant. Starting operations with fewer than 10 employees, the company has grown to a payroll of 1,450 today.

Production schedule at Piper calls for one *Apache* a day, four *Tri-Pacers*, one *Super Cub*, and two *PA-18A* agricultural planes. Coming off the lines now is the Piper *Comanche*, which was previewed by visitors at the open house.

Of Piper's total production, 15 per cent is ear-marked for export.

After their holiday with Piper, 650 airplanes streamed off the runway at about 10-second intervals, controlled by flagmen at the end of the runway.

Not an airplane was scratched during the entire day's activity.

The only unhappy note of the day's CAVU celebration, one guest noted, may have been sounded by Allegheny Airline operations, which was forced to suspend its scheduled stops at Lock Haven because of the lightplane traffic.

LARGEST *number of airplanes ever to attend a one-day fly-in event in the history of aviation is believed to have occurred during the Piper Open House at Lock Haven, when more than 630 craft, ranging from J-3's to Aero Commanders, landed safely, without benefit of individual landing instructions. This view taken shortly after noon, Aug. 17.*

SPERRY C-2
GYROSYN COMPASS

- does not drift
- requires no resetting
- electrically driven
- 3⅛" panel mounting
- 8 lbs. total weight

SPERRY H-5
GYRO-HORIZON

- non-tumbling
- can be used 30 seconds after power application
- electrically driven
- 3⅛" panel mounting
- 2½ lbs. total weight

How much does it cost to fly with instruments of airline accuracy?

The cost is surprisingly small. Especially when you compare it with the investment your business aircraft represents.

The benefits of flight with the Sperry C-2 Gyrosyn* Compass and the Sperry H-5 Gyro-Horizon are a matter of practical business. Modern aircraft need modern instrumentation to fly straighter courses and for more accurate navigation.

The Sperry C-2 Gyrosyn Compass, in contrast to air-driven models, does not drift — requires no resetting. You fly straighter courses, thus reducing flight time and also flight cost.

The Sperry H-5 Gyro-Horizon is also more reliable than air-driven models. It is non-tumbling and can be used just 30 seconds after power application.

Both of these instruments are small, lightweight and engineered for accuracy with Sperry's traditional precision. Both are used where accuracy of schedules and safety are vital — with the world's major airlines. Here they have demonstrated thousands of hours of trouble-free performance.

For further information write our Aeronautical Equipment Division, or nearest district office.

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SAN FRANCISCO • SEATTLE. IN CANADA: SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

Watkins Reports

Twelve Years of BUSINESS FLYING

Operation "Pig-Lift" started when it was decided that Holsapple Belle, a fine Berkshire sow who lives on the Eisenhower farm at Gettysburg, ought to have a mate. The Glenwood (Minn.) All-Breed Swine Assn. chose Commander-in-Chief, 200 lbs. and every ounce a boar, as the ideal swain.

Adolph I. Hogfoss, Assn. president, decided that this exceptional hog should arrive at the President's farm in style. Since Mr. Hogfoss is also a dealer for the J. R. Watkins Co., he asked the company to provide de-luxe transportation for Commander.

Watkins obliged by providing their luxurious DC-3. Representatives of the company, the Glenwood All-Breed Swine Assn., and of the American Berkshire Assn. accompanied Commander in the DC-3. The President was delighted with the gift. He remarked on Commander's flat snout and curly tail as being signs of a good hog. This pleased everyone, but especially the Watkins men, because Commander had been raised from a mere squeal on Watkins Min-Vite.

The records of the Watkins Co.'s aviation activities note many such unusual and imaginative ventures. Although this "pig-lift" is regarded as the most interesting trip ever made in a Watkins plane, the trip is a gesture characteristic of this company, because it shows how much human interest can go into the successful operation of a business air fleet.

Founded in 1868, the J. R. Watkins Co. is now the oldest and largest company of its kind in the world. Watkins manufactures and distributes over 250 products, ranging from insecticides and feed supplements to medicines and cosmetics.

The "extra-curricular" activities of Watkins aircraft are widespread. The DC-3 has been used to give young student farmers an aerial view of soil and water conservation projects, and to carry the athletic teams of neighboring schools on their rounds to competing schools.

Human relations is one of the most important foundations of the Watkins air fleet. The company regards as "hard to overestimate" the importance of being able to maintain personal contact with every branch of its widespread organization.

According to the Watkins house organ, "The fact that Watkins administrative personnel can be transported anywhere in the U. S. or Canada at a moment's notice, in 2 to 6 hrs. time, without . . . waiting for scheduled air or land transportation . . . plus substantial savings in hotel bills, meals en route, etc., have long ago convinced the Company that the use of the airplane for business is a paying proposition."

In June 1952, Watkins undertook a national advertising program, with full-page full-color ads in leading consumer and farm magazines. To give their dealers full advantage of this large-scale promotion, Watkins sales personnel took a 10,000-mi. tour of the country in the DC-3, conferring with dealers and distributors, outlining the new campaign and indicating the advantages which dealers might anticipate from such national publicity.

Watkins regards personal contact with dealers as essential. They are quick to point out that this 10,000-mi. tour, achieving personal contact with practically every one of their dealers, occupied only one month. The same trip, by any other means of transportation, would have taken weeks longer, and would have cost many times what Watkins spent for this dramatic circuit in their own plane.

Another characteristic public relations activity facilitated by business aircraft is the periodic airlift of Watkins dealers from various parts of the country to headquarters at Winona. The Airlift reinforces the idea of unity between the central and branch offices, and adds a gracious note of prestige to being a Watkins dealer.

A typical airlift begins when the DC-3 lands at a given city and ferries the guests to Winona, where they are treated to two or three days of entertainment and sightseeing. An airlift is sometimes used to reward outstanding accomplishments by Watkins field representatives. But whatever the reason, the trips are highly significant to the company and to its employees in human values, since they give the dealers and their wives a chance to meet vis-a-vis with the men at home base.

The Watkins air fleet is invaluable as a means for keeping intact the human touch in modern business, but because Watkins is, after all, a modern business, the airplanes have to prove themselves in economic efficiency too. The Watkins Co.'s experience with airplanes is an impressive documentation of the financial soundness of business aircraft.

In November 1954, when Watkins owned a Beechcraft Bonanza, a trip was made between Memphis, Tenn., and Winona, Minn., which indicated the following flight costs:

Average speed, mph:	150
Operating Cost per Hr.	$3.48
Average Mi. per gal.	18
Average gph.	8.43
Average pints oil per hr. ..	1.06

When the Watkins Co. bought their first business plane in 1945, there were fewer than 200 private business airplanes in the U. S. But, right from the beginning, business aircraft have meant cash in the till for Watkins.

Watkins now operates a Cessna 310 and the DC-3. The 310, a 5-place plane with two 248-hp engines, is equipped with wing-tip tanks, ADF low-frequency dual and omni receivers, Narco 90-channel transmitter-receiver, auto-pilot, altitude control, and oxygen for both passengers and crew.

During its first eight months of operation, the Cessna 310 was operated at an average passenger mile cost of .035 cents. During that time it was flown 142,013 passenger miles. The 310 makes the Watkins fleet more flexible, and increases the economy of shorter flights.

The DC-3, converted by United Aero

(*Continued on page 63*)

Southern Ohio Aviation Company provides CAA-approved aircraft inspection and service.

"On Overhauls, We Recommend Complete Replacement with Aeroquip Hose Lines"

Reports Burl F. Myers, service manager, Southern Ohio Aviation Co., Dayton Municipal Airport

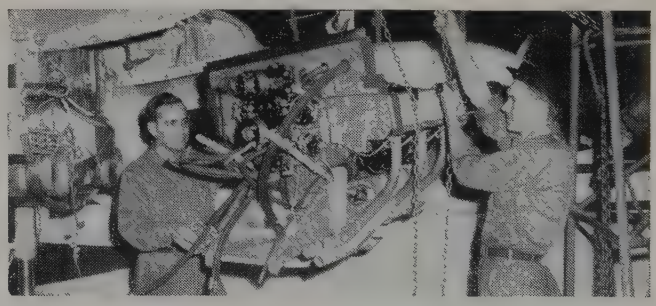
Southern Ohio Aviation specializes in overhaul and inspection of Aero-Commanders, Navions and other business aircraft. Aeroquip Hose Lines, used exclusively for all fluid line maintenance, offer two big advantages:

"We can depend on Aeroquip quality," says Service Manager Myers, "and we can make all our own hose assemblies from a minimum stock of Aeroquip Bulk Hose and Reusable Fittings."

The 'Aeroquip method' of assembling factory-quality hose lines from bulk hose and reusable fittings can greatly simplify hose line inventory and maintenance problems for you, too. Call the nearest Aeroquip Distributor listed below, or write us for full information.

Aeroquip Corporation, Jackson, Michigan
Western Division, Burbank, California
Aeroquip (Canada) Ltd., Toronto 10, Ontario

Hose assemblies are made as they are needed from Aeroquip Bulk Hose and Reusable Fittings. Only bench tools are needed.



On engine overhauls, Southern Ohio Aviation recommends complete replacements of all hose lines with Aeroquip.

Aeroquip
REG. TRADEMARK

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Sky-Store, Hawthorne, California
Spencer Aircraft Industries, Inc., Seattle, Washington
Field Aviation Co., Ltd., Oshawa, Ontario, Canada
Lund Aviation Ltd., Dorval, P.Q., Canada

Mobil's 'Copter:

Business Plus

The boy had been duck hunting deep in the bayous of southern Louisiana and had taken the full charge of a 20-gauge shotgun accidentally fired by one of his three companions. They tried to carry him out, but in 40 minutes they moved only 30 yards through the treacherous morass. The road was a mile away, and the boy was bleeding to death.

One of the boys reached the highway and flagged down a car. Soon two phone calls were made: one to the nearest hospital, the other to Socony Mobil's southwest affiliate, Magnolia Petroleum Company.

In the Gulf of Mexico some 40 miles away, a tiny Bell helicopter sat on the landing platform of a Magnolia offshore rig. It had just brought out an engineer, and pilot Travis Rhodes was below decks having a cup of coffee. With one ear he listened to the chef tell how to make good coffee; with the other he listened for a weather report on the ship-to-shore radio. Instead, he got the emergency call from Magnolia's marine base at Sabine Pass, Tex., near Beaumont.

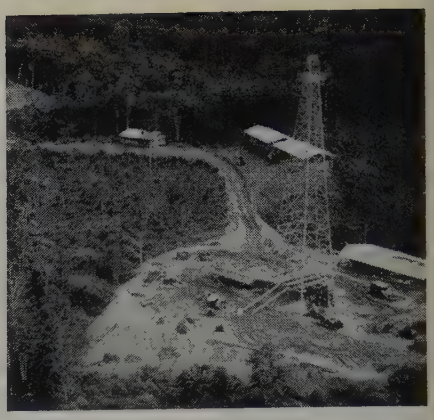
Within minutes Rhodes was over the bayous. He dropped into a clearing, picked up both the wounded boy and a first-aid man who had reached the scene, and flew them to the highway. An ambulance was waiting.

Travis Rhodes had saved the boy's life—and demonstrated once again the two basic qualities that have endeared the helicopter to oil men. It can reach into areas that are inaccessible by land; it can sit down on any spot large enough to swing a rotor blade.

In the past decade, oil men have carried their search for oil into the remote corners of the globe. The easy-to-reach oil is getting scarce. Wildcatters of Mobil affiliates are working in East Pakistan, North Africa, and South America, and the versatile helicopter is making the job easier.

In New Guinea, where oil men have been using helicopters for several years, Papuan natives clear landing areas in the jungle with power-operated chain saws. Then the helicopters fly seismic parties—with all their instruments, dynamite and shot-hole drilling equipment—from clearing to clearing. The oil-hunters cover far more territory than they could on the ground, and bring back twice as much exploration data.

Last year, wildcatters of a Standard-Vacuum Oil Company affiliate picked out a likely well site deep in the rain forest of West New Guinea. But it would have taken a year to slash a road through the jungle—if weather had permitted. The costs would have been prohibitive. So the resourceful wildcatters mounted the entire operation by air.



CICUCO *swamp in Colombia, S.A., is one of the oil-rich spots which are practically inaccessible except by helicopter.*

Two Westland-Sikorskys carried the drilling rig, mud pumps, generator plant, drill pipe, draw works, supply sheds, huts for the men—everything. Bulky items were slung in steel cables under the helicopters.

The helicopters not only brought in the derrick, section by section, they also helped erect it, hovering overhead like giant sky-hooks.

This wildcat was a dry hole, but the helicopters had proved they could save money and time—more than a year's time in this case—and thus make more wildcats possible.

For the most part, the Mobil companies have chartered helicopters from private concerns—for specific missions in hard-to-reach areas—instead of buying them. Magnolia's Bell is the first helicopter the company has purchased, and in this case its unique advantages have paid off handsomely.

Travis Rhodes has ferried more than 2,000 passengers—mostly technical men needed on a rig in a hurry—and thousands of small parts to Magnolia's offshore rigs since Magnolia bought the helicopter in Nov. 1954.

Rhodes, who flew helicopters in Korea, considers the craft at least as safe as conventional airplanes. In case of engine failure, air pressure against the rotors keeps them spinning—and keeps the craft from falling too fast.

A new navigational device—the "Helihomer"—has solved the problem of finding an offshore rig in bad weather. It was dreamed up by Sam Willis, Magnolia's chief pilot, and developed by the Clover Field Radio Supply Co. A receiver in the helicopter picks up signals from the offshore rig, and guides the pilot straight to the landing platform.

The helicopter has paid for itself in routine shuttle service to and from the offshore rigs—but money can't measure its value in air rescue service.

One of the most impressive rescue

(*Continued on page 86*)

COMPANY *helicopter about to land on the platform of a Magnolia offshore oil rig. Helicopters are invaluable to the oil industry for their capacity to land in any spot "big enough to swing a rotor blade." They have also provided vital rescue services.*

DC-3
FOR SALE — *Immediate Delivery*

NEW SHIP GUARANTEE!
"MAXIMIZED" BY AIRESEARCH

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COMPLETELY NEW WIRING

SUPER PERFORMANCE—CRUISE AT 600 HP, 200 MPH PLUS

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AIR STAIR DOOR

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MANY OTHER EXTRAS

All work on this airplane has been performed in the facilities of AiResearch Aviation Service by experienced technicians under rigid inspection and testing controls.

The "maximized" DC-3 illustrated is for sale directly by AiResearch to purchaser. Call ORegon 8-6161 or write to the address below.

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Conversion and Modification • Custom Interiors • Electrical and Instrument • Radio and Electronics • Engineering Service • Turn-Around Service

Take-Off Aids to Pilots

By R. P. Snodgrass
Director, Flight Research
Sperry Gyroscope Company

Flight Safety Research statistics in recent years have shown that take-off accidents constitute a major loss in the Air Force. In this group of accidents, a significant percentage can loosely be termed "pilot error" accidents. Most common are cases where the pilot thought there was something wrong with the take-off, when actually take-off performance was normal, chopped the throttle and went off the end of the runway. Among emergencies resulting in accidents, such as those in which partial power loss occurred, cases show the pilot aborted the take-off too late and didn't make it.

These types of take-off accidents have been on the increase since the advent of jets. The jet take-off has become more critical and hence more subject to pilot error accidents because:

1. The margin between take-off/stop distance and the available runway has steadily decreased in recent years.

2. There is a wider variation in take-off performance in any given jet type due to greater operational weight variations and greater thrust variation with altitude and temperature.

3. There has been a loss in kinesthetic and auditory cues for the jet take-off due to lack of noise and vibration.

In an attempt to counteract these factors, the Air Force jet pilot is now required to write the take-off distance on his flight clearance. This forces the pilot to compute and then "go on record" as to his take-off distance.

However, it is still not practical to anesthetize the anxiety centers in the seat of the pants. To overcome this, we now have "line" speeds and "refusal" speeds. It has been my experience that the meaning of these speeds is not well understood by pilots, or engineers for that matter, nor do they give a complete description of the take-off for use by the pilot. This is particularly true of the "refusal" speed.

The quantities for a typical take-off are shown in *Figure 1*. Here the pertinent speeds are shown with available runway length, line check distance, the take-off distance, and the stop distance.

The "line" speed provides the pilot with an assessment of his predicted take-off performance. Here the pilot compares his speed against some distance marker located along the edge of the runway.

The "refusal" speed is the highest speed which can be attained with a *normal* take-off and still permit a stop on the runway. Take-off speed and take-off distance, of course, are straightforward items.

"Line" speeds and "refusal" speeds have been in use for several years in jet bomber aircraft, and more recently in fighters. From an engineering point of view, this system should work.

All the pilot need do is check his speed when he passes a given distance marker. If the speed is OK, the take-off is proceeding according to the handbook. The next point is "refusal" speed. If partial power occurs after the line speed check and the speed is less than "refusal," a safe stop can be effected. If the speed at time of power loss is greater than "refusal," the pilot can take a chance on continuing the take-off, or on going off the end of the runway on the stop. If take-off performance is normal throughout, then take-off speed is where the lift-off can occur.

In practice this system of checking take-off performance doesn't work too well. For example, it doesn't work at all at night or in low visibility, because the pilot can't pick out the distance marker for the line speed check. Without the line speed check, the refusal speed is meaningless, since refusal is predicated on a normal take-off. In CAVU daylight operations, the system is unsatisfactory because of the short time interval which generally exists between the line check and the refusal speed.

It is this dynamic aspect of the pilot's evaluation problem which seriously limits the effectiveness of the "line" speed —"refusal" technique. It is also this dynamic aspect which leads "arm chair" conclusions into error. When we are static we are very prone to view problems in static terms rather than as a continuously changing environment with control requirements superimposed upon the monitoring functions of the pilot. An illustration of a typical take-off in a jet fighter will serve to illustrate the difficulty of the "line" speed—"refusal" technique.

Consider the take-off of one of our Century series fighters in conditions of no-wind, sea level, 15°C and at a typical operational configuration. This aircraft has a take-off speed of 173 knots and a take-off distance of 3,400 feet—the distance for the wheels to break ground. The time for the take-off, from "brakes released" to "wheels off," is 23 seconds. The take-off has an average acceleration of 12.5 feet per second squared, or slightly less than ½ G longitudinal acceleration. Let us assume an 8,000 foot runway. We will select a line check distance of 2,000 feet. From the handbook charts, the line speed at 2,000 feet is 140 knots. The refusal speed for the 8,000 foot runway is 153 knots and at this speed, assuming normal take-off acceleration, the aircraft should have covered 2,500 feet. The take-off speed, as previously mentioned, is 173 knots and a distance for this speed is 3,400 feet.

Thus the pilot has three speeds to

(*Continued on page 89*)

A TYPICAL SPEED-DISTANCE RELATIONSHIP FOR TAKE-OFF

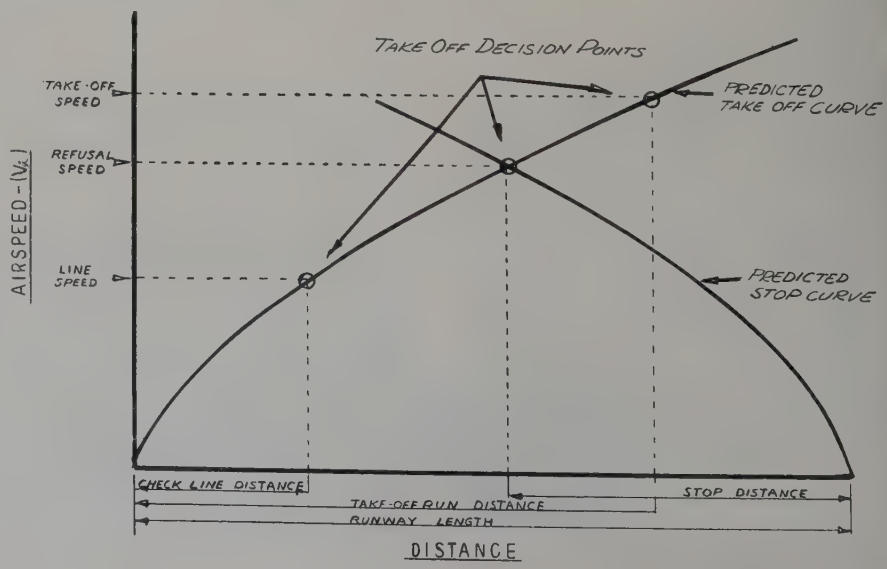

FIG 1

Never Before So Many Features!
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NEVER BEFORE
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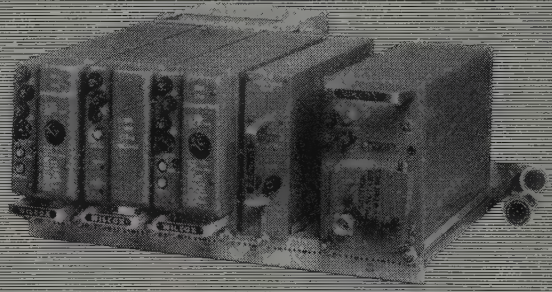
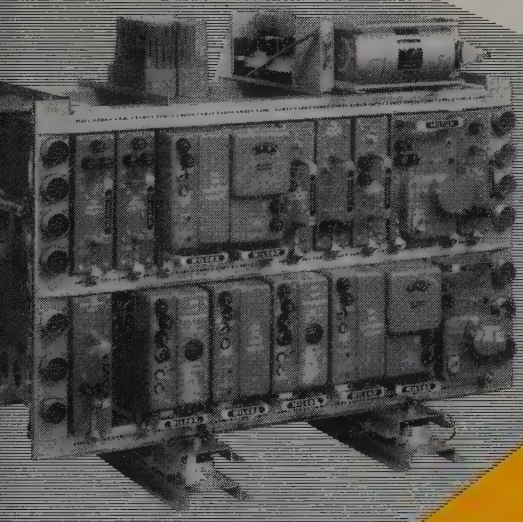
CANARI

(Communi ation and
Navigation Airborne
Radio Ins rumentation)



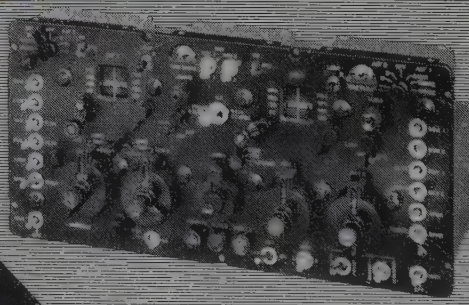
Just Look!

- **CUTS SPACE NEEDS IN HALF!**
- **WEIGHS ONE-THIRD AS MUCH** as conventional equipment!
- **UNIFORM SIZE** — height and depth are the same for all units — width in definite fractions of ATR!
- **ECONOMICAL** — allows for increased pay load or fuel supply!
- **SYSTEM ENGINEERED** — for easier installation and maintenance!
- **COMPLETE SYSTEM** — contains all basic navigation and communications devices!
- **SIMPLIFIED DESIGN** — assembled on one, custom-fitted shockmount!
- **EASY-TO-INSTALL** — just one junction box! Only simple plug-type connections!
- **RELIABLE** — only airborne, ruggedized tubes and MIL approved and derated components are used.
- **DEPENDABLE** — It's made by Wilcox!



The CANARI is available as a complete system or individual units:

ADF Model 701
ILS Glideslope Receiver Model 700
VHF Navigation Receiver Model 706
Marker Receiver Model 702
VHF Communications Receiver Model 705
VHF Transmitter Model 707
HF Communication Model 704
Public Address Model 708
Isolation Amplifier Model 709/710
ATC Transponder Model 714



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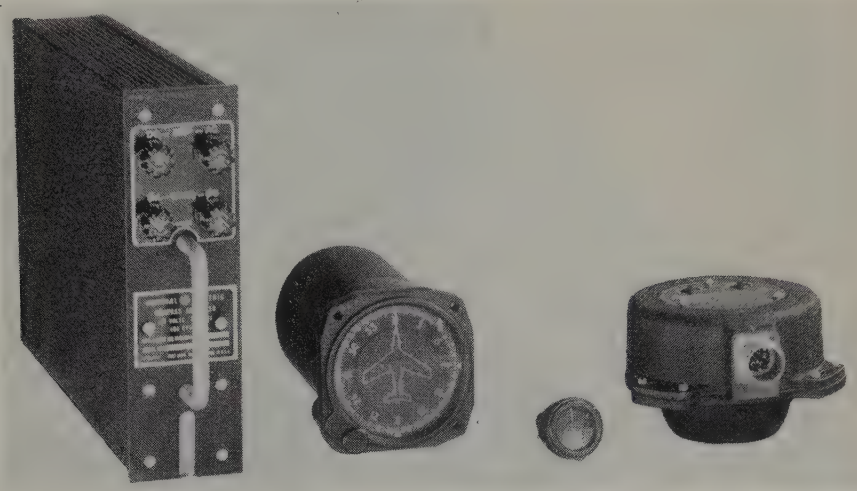
NAVICOM

New Gyro-Stabilized Compass System



A new low-cost light-weight compass system has been developed by the General Electric Co., West Lynn, Mass. Low initial cost and reduced size and weight make the system suitable for use in any size aircraft down through the smallest business type.

The system consists of a panel-mounted, electrically driven gyroscope which is slaved electrically to a remotely located compass transmitter. This provides a gyro-stabilized magnetic heading reference of unprecedented accuracy and dependability. The output synchro is capable of operating up to three R.M.I. repeaters and may also be used to provide initial signal to a compass servo adapter for additional outputs if required.

Designed to operate on 115 volts AC and 14 or 28 volts DC, the system has a power consumption of from 17 to 24 watts. Overall weight is approximately 10.5 lb. installed. The system is CAA type-certificated for use on scheduled airline aircraft.

The distributor is Wilcox Electric Company, Kansas City, Missouri.

New Lights at Washington National

The CAA will evaluate new Sylvania runway floodlights at Washington National Airport this fall.

The fluorescent bar lights are designed to eliminate the so-called "black pit" effect that pilots report appears along the runway after the transition from high intensity approach lights to the conventional runway lights.

Installation of the new lights will begin approximately Nov. 1. They will be located on the south end of the instrument runway starting 200′ from the end and extending 1,300′ to the north. They will be installed on both sides of the runway except for 150′ along the west side at the intersection of the closed east-west runway.

The lights will be mounted on frangible fixtures 18″ tall and 96″ long. The fluorescent lights will be hooded to prevent glare and the aluminized reflectors will be glass enclosed for protection against dust, rain and snow.

The fluorescent floodlight system was evaluated last winter in a temporary installation at Andrews AFB along with two flush-type high intensity runway lighting systems, and met enthusiastic approval from airline pilots assigned to the evaluation project. The existing high intensity runway lights at Washington National will remain in place.

Automatic 5-Inch Horizon Provides New Flight Accuracies

A new, self-contained gyro horizon providing accuracies approaching gyro-stabilized "platforms," at less weight than remote vertical gyro systems, is under production by Sperry Gyroscope Co.

The new 8 lb., 5″ pictorial instrument combines the reliability of the self-contained gyro types and the pictorial "natural horizon" presentation available previously only on repeater indicators. The instrument incorporates two unique erection features, making it a virtually automatic unit.

An initial, automatic erection system brings the H-10 into full operation within 50 seconds after the plane's electrical system is turned on. A demand quick-erection system, activated at the touch of a button, provides the pilot with a means of immediately canceling any errors which might be generated during violent maneuvers.

Level flight is not necessary when activating the quick-erection system. It functions perfectly—eliminating precession error within 20 seconds—at any flight attitude.

In the event of aircraft electrical system or engine failure the H-10 will provide reliable attitude data for as long as 12 min. The lengthy rundown period provides the wide safety margin necessary sometimes to bring a disabled aircraft from Instrument Flight Rule conditions to altitudes affording safe visual flight.

Virtual elimination of turn errors is assured by the H-10. The instrument automatically converts to free-gyro operation when a bank angle of more than 6° is encountered. It returns to gravity-slaved operation as the maneuver is completed.

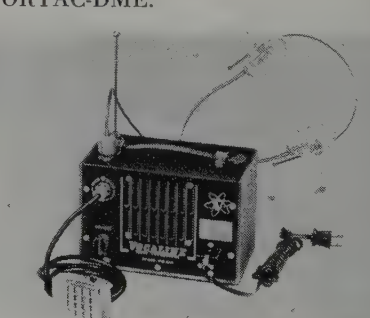
The inherent reliability of the instrument itself has been increased by hermetically sealing the entire unit in an aliminum case. Its overall dimensions are 5 x 5¼ x 8″. The official designation of the unit is the H-10 Direct-Reading Spherical Attitude Indicator.

VORTAC DME Production Due To Roll Early in 1958

Simultaneous with the commissioning of the first TACAN installation at Phillipsburg, Pa., and the announcement by Federal Telecommunication Laboratories of the planned first installations of VORTAC ground stations at Idlewild and Newark Airports, FTL advises that their lightweight airborne VORTAC DME will be in quantity production in early 1958.

FTL's Radio Navigation Laboratory engineers, who developed the unit which they claim is the lightest and smallest under development anywhere, expect to have the necessary engineering information available for quantity production by the end of this year.

Considering the recent announcement by the airlines' spokesmen in the Air Coordinating Committee reversing their stand on their proclaimed need for this equipment, the FTL development recalls the fix of the large business aircraft operators who invested in civil DME to see it cut out from under them by the ACC decision establishing VORTAC-DME.



NEW LOW-COST *lightweight air-to-air, air-to-ground, ground-to-ground transceiver operates on either 6V or 12V DC current, and 155 V AC current, may also be plugged into airplane cigar lighter. Reported price under $100. Distributed by Air Associates Div. of Electronic Communication.*

Improved Radar Coverage Planned For Business Flying

An engineering study aimed at increasing the coverage and efficiency of CAA-operated Airport Surveillance radar will be undertaken for the Government by Airborne Instrument Laboratories.

Under the contract, AIL will investigate the limitations of existing airport surveillance radars and come up with suggestions as how best to increase the altitude and range of the equipment. In addition, recommendations will be made to improve the visibility of targets from small aircraft when flying over strong fixed ground targets, and to reduce radio-frequency interference to and from adjacent radars.

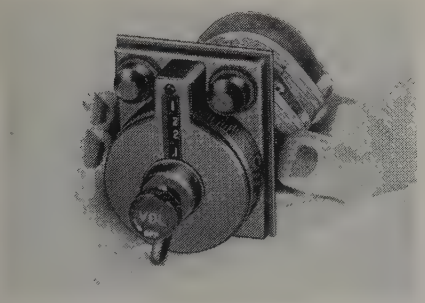
Generally, existing CAA airport surveillance radar now has an operational range of 30 nm and altitude coverage of up to 10,000′ for small twin-engine propeller-driven aircraft increasingly used in business flying.

New VHF Remote Control Head

A new line of edge lighted, competitively priced, remote control heads for VHF radio equipment is now in production by Transvaal Engineering Corp., Culver City, Cal.

The Transvaal Control Heads, which are designed to comply with MIL specifications, incorporate a spare panel light. The control head also incorporates the on-off switch, volume control, and channel selector.

Small, compact, and light weight, the unit measures only 2⅝″ by 2″, and weighs less than ¾ lb.



Aerojet Announces Infrared PWI

An infrared Proximity Warning Indicator that could have given sufficient warning in "at least" 80% of mid-air collisions, has been developed by the Avionics Div. of Aerojet-General Corp.

Area coverage on all sides is provided by a unique scanning system, consisting of a small hyper-hemispherical protruding dome which contains a rotating mirror sweeping 360°. When the mirror "points" at an approaching aircraft, or any heat-producing source within range, this information is "processed" by an infrared-sensitive photo conductor cell and an electronics "package" and displayed on a cockpit indicator. The complete weight of the system is 30 lbs.

Major Advance in Electronics Simplifies Design

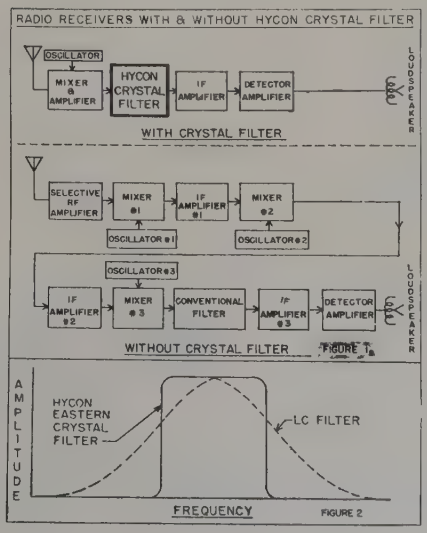
With more and more radio communication messages crowding the airwaves, allotment of frequency bands to various radio and radar needs has become an ever-increasing problem. Up to now, filters have presented serious bottlenecks to designers of high frequency radio systems. The higher one goes in frequency, the harder it becomes to design a workable filter.

A new device, called a high frequency crystal filter, makes it possible for more radio stations to transmit without overlapping and interfering with each other. At the same time, the new device greatly simplifies electronic equipment. High frequency crystal filters are to existing conventional filters what transistors are to vacuum tubes. Mass-produced high frequency crystal filters represent a major breakthrough in the communications art.

One of the biggest headaches with radio receivers in the past has been the constant servicing necessary, particularly tuning and alignment. With crystal filters, a radio receiver does not normally have to be aligned once it is manufactured. The quartz crystals, each about ½ the size of a small silver coin, are extremely stable under severe environmental conditions. Abrupt temperature changes and repeated heavy shock and vibration do not adversely affect the crystal filters.

Simpler radio and radar receivers will result from the inclusion of crystal filters. A technique known as multiple conversion has been used for years to get around certain filtering problems. Using a crystal filter in the circuit, multiple conversion becomes unnecessary. The result is a radio or radar receiver with fewer parts. The higher the frequency of the receiver, the more applicable this simplification becomes. And higher frequencies are the trend.

Hycon Eastern Inc., an affiliate of Hycon Mfg. Co., Pasadena, Cal., has just announced the availability in mass quantity of the unique filters.

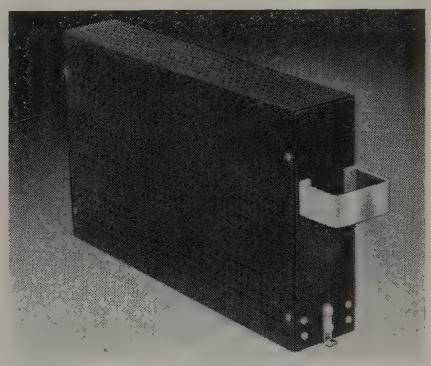


New Lightest-Weight Glide Slope Receiver

The LearCal Div. of Lear, Inc., Santa Monica, Cal., has announced a new lightweight Glide Slope Receiver which has a fully transistorized internal power supply with no moving parts. Identified as the Model LGSR-1, the unit weighs only 5 lb., the lightest-weight Glide Slope Receiver now on the market. It is contained in a ¼ ATR short-length case which mounts on a dual unit shock mount and meets military, CAA, and ARINC requirements.

A solenoid-operated device drives the switch that selects the correct crystal for each frequency. Only the crystals are switched, and no other tuning functions are required, because all circuits are broadly tuned for uniform response on all 20 frequencies in the UHF 329.3-335 Mc/s band.

The Model LGSR-1 is available for operation on 12 or 24 volt DC or 115 volt AC 400-cycle current.



Flight Safety Has New Facility

Flight Safety, Inc. announces the opening of its third facility for the refresher training of Professional Pilots in Chicago, July 1st. The operation is located in the Butler Hangar at the Chicago Midway Airport.

Two modernized Link trainers modified to provide automatic radio aids and realistic "feel" are available, in addition to professional flight instruction and Ground training.

Flight Safety's New York facility at LaGuardia Airport has been offering complete refresher training programs for professional pilots since 1951. The addition of the Chicago operation has been brought about due to the tremendous increase of requests in that area for refresher flight training.

The firm also has a training facility operating in the Domestic Terminal Bldg., Houston, Tex. The combined operations are currently assisting over 850 pilots in maintaining their flight proficiency at peak performance level.

Jack & Heintz Equipment Catalog

Jack & Heintz, Inc., has issued a new catalog of aircraft equipment.

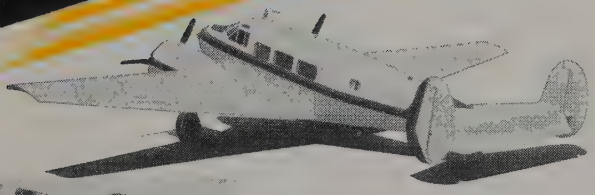
The 12-pg. booklet contains design and performance data on about 100 current models of generators (ac & dc); regulators; control panels; transformers; turbojet engine starters, and many other electrical items and components.

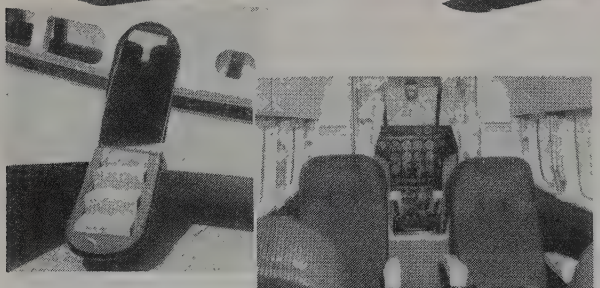
(*Continued on page 51*)

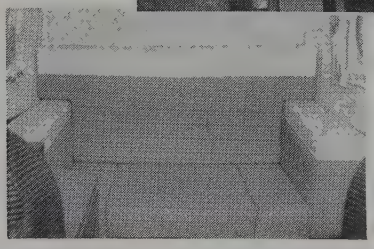
Cair announces...

the PAGAN

Brilliant new Beechcraft D-18-S modernization offers special advantages for business flying







Creative engineering and design have advanced the Pagan beyond the ordinary concept of executive conversion. Increased power, speed and payload. Greater comfort, convenience and more attractive appearance. The Pagan is a high-performance executive transport offering more of everything you want in a business airplane today.

Useful load capacity, for example, is increased to approximately 3000 lbs. That's about 900 lbs. over standard "D" models! The Pagan's 3-blade propellers, power plant improvements, sleek new wing tips, tail gear door and many other modern features add to all-around higher performance and utility. Wing fuel tanks free space for radar.

Inside, the Pagan offers unequalled spaciousness and luxurious styling. Big picture windows, plenty of stretch-out room and other conveniences for the ultimate in passenger comfort.

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SAFETY EXCHANGE

Engine Failure Downs Oil Company Lodestar (CAB Report Abridged)

On December 12, 1956 a Lockheed Lodestar, owned and operated by Phillips Petroleum Co., crashed and burned 6½ miles southeast of the Bartlesville, Oklahoma Municipal airport. Pilot Joe Mark Bower, co-pilot-mechanic Robert Ulrich and six passengers were killed. The flight was enroute Bartlesville to Salt Lake City IFR non-stop.

At time of takeoff, 0826, the gross weight of the aircraft was 19,284 pounds (maximum allowable was 19,500 pounds), and the load was properly distributed with respect to allowable center of gravity limitations.

About 14 minutes after takeoff, at approximately 1840, co-pilot Ulrich called Bartlesville Radio and stated that the flight was having engine trouble, with an oil temperature over 100 degrees, and requested that the IFR flight plan be cancelled as they might return.

At the next contact, about 0845, the co-pilot again called Bartlesville Radio stating that they could not unfeather the propeller. At that time he asked the Bartlesville operator to determine the condition of the runways at Tulsa (about 40 miles to the south). This information was obtained and immediately relayed to the co-pilot, whereupon he said, "Going to Tulsa, changing over." Bartlesville's single 4,600-foot runway had patches of snow and ice while all runways at Tulsa Airport were clear. This was the last radio contact with the flight. None of the messages had mentioned which engine was giving trouble; none indicated any anxiety or stress. There is no known record of N 28366 having made radio contact with any ground station or aircraft other than Bartlesville Radio.

About the same time as the last radio contact, the Bartlesville radio operator and Phillips' chief pilot saw the aircraft passing south of the Bartlesville Airport heading easterly. They estimated its altitude to be 3,000 feet above the ground. The aircraft continued east for about 4½ miles, until beyond the more congested part of Bartlesville, and then turned to the right about 90 degrees toward Tulsa.

A number of persons saw the flight after it turned toward Tulsa. When it had been on this southerly heading for about four miles the aircraft was seen to plunge to earth in a manner described by several witnesses as a spin. Impact with the rolling terrain was on a heading of about 240 degrees, while the wings were about level, and while the nose-down angle was close to vertical. An explosion and intense fire ensued, largely destroying the general structure of the aircraft.

Investigation

At the time and place of the accident the weather was generally good and readily allowed VFR flight. Early in the investigation the possibility of collision with, or encountering of violent wash from, other aircraft was advanced as a reason for the seeming loss of control. Accordingly, this possibility was thoroughly probed. None of the several witnesses who actually saw the Lodestar in apparently normal flight, and then descend in what appeared to be a spin, saw any other aircraft at the time or reasonably close to that time. In short, investigation determined that no other aircraft was involved in this accident.

A consensus of ground witness testimony indicates that: The altitude of the aircraft decreased from an estimated 3,000 feet as it passed south of the airport to considerably less altitude, possibly as low as 1,200 feet, as it neared the crash site; the speed of the aircraft decreased during this short interval; the final part of the flight was stable directionally toward the south and stable laterally with wings level; the aircraft fell off to its right and spun slightly more than two turns to its right before striking the ground.

Extreme localization and physical features of the general crashing and deformation of the wreckage indicated that the angle of impact was within 15 degrees of vertical. There was no evidence of rotation of the aircraft about the longitudinal axis. This, together with the steep impact angle and the similar damage to both wing leading edges, suggests that there may have been an attempt to recover from the spin. No part of the aircraft was found elsewhere than in the wreckage area, indicating that no parts were shed prior to or during the final descent. There was no evidence of fire before impact. Violent impact and fire had destroyed a great deal of the general structure.

The master ignition switch was "On." Both individual ignition switch levers were sharply bent to the left, the right one beyond the "both magnetos on" position, and the left one to the left of the "off" position.

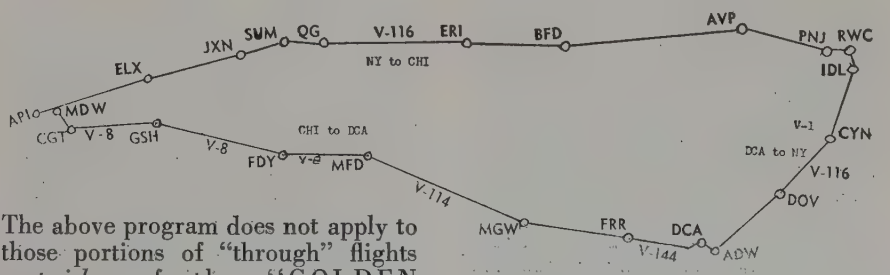
The autopilot was "off." The landing gear handle was about midway of the quadrant and bent sharply to the left. The flap handle was at "up" position. The left fuel tank selector valve was turned to the right front tank and the engine selector valve to the right engine. This aircraft was not equipped with wing de-icer boots.

Impact and fire damage precluded determining the readings of any of the cockpit indicators for rudder, elevator, and aileron trim. The engines' fire selector valve was positioned in the normal "off" position and the oil shutoff valves were in normal operating position. Fuel dump valve handles were broken off.

Examination of the aileron, rudder, and elevator control mechanisms disclosed no irregularities or breakage other than caused by impact and fire. All primary cables and trim tab cables had parted in the burned-out area. No evidence of metal fatigue was found in

THE "GOLDEN TRIANGLE" CLARIFIED

Since July 1, 1957, all airline flights operating *within* the "GOLDEN TRIANGLE," file and operate under IFR procedures at all times when above 9500 feet MSL. Additionally, all such flights will be operated within controlled airspace, except for circumnavigation of turbulent areas if "on top," or if at an assigned altitude, Air Traffic Control shall be notified of intention to deviate and upon return to ATC route. Although airline flights will continue to accept VFR climbs and descents below an altitude of 9500 feet MSL or when VFR "on Top" as part of an IFR clearance, such restrictions will not be accepted above 9500 feet MSL when not "on Top."



The above program does not apply to those portions of "through" flights *outside* of the "GOLDEN TRIANGLE."

(Ed. Note:—The above is offered in response to the many inquiries received from business pilots as to whether this procedure applies to their operation. This is a *voluntary* agreement involving ALPA and ATA. It is suggested that executive aircraft operating similarly will obtain equivalent benefits and additionally, assist in testing ATC's capacity for handling such a load if this procedure were made a requirement as it *is* in Canada!)

any of the broken parts. Impact had moved control tabs so that their settings were incompatible and meaningless.

Number 1 (left) engine. The rear master rod was seized to the crankshaft and the front one was immobilized by impact. Master rod bearing material was found loose in the power section. The rear master rod bearing had failed completely. All of the lead indium coating of this bearing and approximately 95% of its silver was worn away. Bearing oil holes were plugged with this material and bearing shells were blued by overheating. Approximately 45% of the bearing material was bonded to the rear crankpin. Two of the rear crankpin oil tubes were completely filled with bearing material.

The front master rod bearing was intact with no indications of failure. A small area, approximately one-half inch wide, of the lead indium coating was slightly worn. Bearing and front crankpin oil holes were open and free of foreign material.

Both master rod assemblies were in place with only the rear rod showing signs of high operating temperatures. The crankshaft and its counterweight bore no evidence of operating difficulty. Both front and center main bearings were intact and free of failures; the rear main bearing had been severely heated by ground fire.

The carburetor, a Stromberg model PD12H-4, S/N 266279-A, was broken from the rear case. Its fuel control assembly had broken free and the mixture control was jammed in the idle cutoff position. The fuel strainer was broken and the fuel screen was free of any foreign matter. The throttle assembly was jammed in full closed position and the fuel discharge line had broken free. The propeller governor had separated from the nosecase at impact. Its control cable was severed. This governor appeared to be in normal condition and with no evidence of foreign material.

Number 1 (left) propeller. This propeller was tight on the shaft and Nos. 2 and 3 blades were tight in the hub; the No. 1 blade was broken off at the shank. The pitch-changing mechanism was in normal condition. The stop rings were in place and set for a range from 88 degrees, full feathering, to 24 degrees, low pitch. The dome piston position corresponded to a blade angle of 81 degrees.

All blade bearings, thrust washers, and segment gears were free of indications of inflight failures. The shim plates of all three blades of the propeller were marked at impact, indicating a blade angle of 88 degrees, and were broken along the impact loading lines. Nothing was found during the examination of this propeller and its associated mechanisms to show why it could not have been unfeathered.

Number 2 (right) engine. This engine was also examined with great detail. Nothing was found to indicate any malfunctioning, no excess or abnormal wear was evident, and there was no sign of oil starvation. The accessory section of this engine was destroyed by fire. It was therefore impossible to determine whether or not a malfunction or failure in this portion of the engine had occurred. Examination of the spark plugs in this engine revealed no evidence to cause operating difficulty. The propeller governor was broken from its mounting at impact. It appeared normal with no indications of foreign material or excessive wear.

Number 2 (right) propeller. The propeller was tight on the shaft with two blades broken off at the shank; the remaining one was tight in the hub. The dome shell mechanism exhibited no indications of maloperation prior to impact. The dome piston position corresponded to a blade angle of 24 degrees low pitch. The impact marks on the shim plates of all three blades indicated blade angle of 24 degrees.

Fuel and Oil. Samples of the fuel and oil were collected immediately after the accident. The fuel sample, 91/98 octane, was taken from the storage tank used by N 28366. Analysis of the sample indicated that it was considerably better than the specification minimums. An oil sample taken from a barrel used in servicing N 28366 and oil from the No. 1 engine met required specifications. Spectographic analysis of the oil from the No. 1 engine was made for trace metals and it only reflected the presence of master rod bearing materials.

Pilot Bower had been employed by Phillips for more than eight years prior to which time he had been employed as a captain for a major airline. He held all necessary CAA certification and had flown some 8,800 hours, 700 in Lodestars. Co-pilot Ulrich, also adequately certificated, had some 3,000 hours of piloting, of which 500 hours had been in Lodestars. It was company policy to work pairs of pilots together as unit crews and these two had flown together quite consistently in the subject aircraft and in others.

Bower was flight checked in this particular Lodestar by Phillips' Chief Pilot Clark on October 18, 1956. The aircraft at that time grossed a computed 18,274 pounds. The check flight of 1:15 duration covered a variety of unusual flight conditions including single-engine operations, single-engine operation at near stall speed, and the checking of speeds close to the stall point. Different flight configurations, involving landing gear and landing flaps, were also tried. Chief Pilot Clark was completely satisfied. At the time of the flight check, the maximum gross weight of the aircraft was 18,500 pounds; authorization for an increase in maximum gross to 19,500 pounds became effective 22 days prior to the accident.

The Bartlesville Airport and the crash site are at substantially the same elevation, 715 feet m.s.l. It was estimated that the aircraft was about 1,200 feet above the ground when the spin started, or 1,900 feet m.s.l. The subject aircraft, grossing 19,500 pounds, should have been capable of sustained single-engine flight at maximum continuous power at that altitude, a prerequisite of CAA certification. Its maximum single-engine operating altitude with en route configuration (flaps up, gear up, and inoperative propeller feathered) was 7,600 feet. This presumes sustained maximum continuous power.

Analysis

There are a number of possibilities to account for the loss of control. Pilot Bower may not have been sufficiently alert to the somewhat critical single-engine flight characteristics of the aircraft grossing as much as it did. It has been mentioned that the computed gross at takeoff was 19,284 pounds, quite close to the maximum allowable of 19,500 pounds. The duration of the flight, about 24 minutes, would have lessened the fuel weight by possibly 400 pounds. The aircraft would thus have grossed about 18,884 pounds at the time of the accident. Bower was quite familiar with the subject aircraft at a lesser weight. The fact that Bower decided to continue for 40 miles to Tulsa, over flat terrain and in good weather, rather than land at his home field indicates that he was not particularly perturbed. And yet within a few minutes considerable altitude had been lost as well as enough speed so that control was also lost.

Other possibilities remain. One is of an obscure irregularity of control although none was found in that part of the wreckage which could still be gainfully examined. Another was power reduction in the remaining engine. Again nothing was found to indicate or even suggest this. Of course, the single-engine flyability of the aircraft was dependent upon sustained maximum continuous power from the right engine, with the left propeller feathered, as this one was. As has been pointed out, it is impossible to determine if maximum continuous power was sustained.

Neither induction nor wing icing appears to have been possible.

The reason for the inability to unfeather the left propeller was not learned. Had it been possible, and if the left engine could have been temporarily brought back into use (this does not necessarily follow because of the nature of the bearing damage), Bower undoubtedly would have landed at Bartlesville, as must have been his initial intent. Possibly there was an electrical defect in that propeller feathering mechanism undetermined because of destruction by fire.

Obviously, the failure of the rear master rod bearing of the left engine was the reason for the reported rise in oil temperature necessitating shutting down that engine. The cause of the bearing failure cannot be determined due to the complete destruction of that bearing. It probably was not oil starvation because this would normally cause distress first in the front bearing which receives oil after the

(*Continued on page 78*)

SAFETY DIGEST

RICHARD W. GROUX, *Assistant to Executive Director NBAA*

Compiled and edited from leading air safety publications issued by military, naval, airline, government agencies and from private and business pilots' experiences.

I guess the best safety education our breed can get is by kicking the old iron bird around the blue. The rest of the learning process consists mostly of what we see and hear of others' experiences. The old adage about an ounce of prevention being worth a pound of cure takes on added significance in terms of air safety.

The true professional continually interests himself in what information he can gain of others' mishaps. Because he knows that by proper study of their misadventures he can better prepare himself against similar happenings. Every accident and incident report carefully reviewed becomes a valuable lesson when potential hazards are uncovered and plans are made to avoid them.

So how about heeding the word EXCHANGE in the caption above and send along your experiences—good and bad, ideas, suggestions and viewpoints concerning safety. The information doesn't have to be formal and anonymity will be provided upon request.

Lets spread the good word around.

Depth Perception

Depth perception is not dependent on the use of both eyes, the USAF Department of Ophthalmology has revealed. This contradicts the previous opinion that depth was dependent on the sense of perspective.

Using only one eye, depth perception can be accurately judged by reference to motion parallax. Parallax is the apparent difference in speed of movement of two objects at different distances from the viewer and can be used to judge the depth of field. Hence it is possible for a pilot who has lost the sight of one eye to land his aircraft safely. (Wiley Post flew for years with the sight of only one eye.)

The USAF has developed a motion-parallax tester in the examination of candidates for flight training.—APPROACH—the naval aviation safety review.

Check and Double Check

At 0505 CST, an S2F-1 (Grumman Tracker) departed NAS Memphis on the Memphis-Dallas leg of a Quonset Point to Dallas cross country training flight. A little over an hour after take-off, the pilots noted the fuel quantity gages moving down rapidly, and they turned back toward an airfield passed 15 minutes earlier.

Immediately following the turn, the fuel pressure on the starboard engine dropped to 12 psi and the engine quit. Fuel boost pumps were turned on, and when the re-start attempt was unsuccessful, the engine was feathered. Three minutes later the port engine quit at an altitude of 1200 feet.

The pilot made a pitch dark, dead-stick, wheels-up, flaps-down, crash landing in a pasture. The aircraft skidded to a halt among some small trees after shearing off the left wing. Fortunately, neither the pilots nor the two enlisted passengers was injured in the crash—but one passenger sprained his ankle by jumping onto the fork of a tree while evacuating the aircraft. The airplane was a strike.

The airplane had been fueled the previous evening by a refueler operator from the civilian contractor who stated that he always filled tanks and left the gas caps off or else set the caps in place without locking in order to prevent moisture from getting into the tanks.

The accident board concluded that the pilots failed to make a positive check that the fuel caps were in place and locked with the result that syphoning occurred through the filler neck of the fuel tanks. Both engines stopped because of fuel starvation.

Appraisal of the Hazards of Friction-Spark Ignition of Aircraft Crash Fires

A study was made to determine if common aircraft metals produce friction sparks capable of igniting combustibles that might be spilled in an airplane crash. Samples of aluminum, titanium, magnesium, chrome-molybdenum steel, and stainless steel were dragged over both concrete and asphalt runways while a combustible mixture of gasoline, JP-4 fuel, kerosene, or preheated oil was sprayed around the sample. No ignitions occurred from the sliding aluminum; but the titanium, magnesium, chrome-molybdenum steel, and stainless steel produced friction sparks that ignited the combustibles. (NACA TN 4024).

Toxic Means Poison!

By Captain Eugene B. Konecci, USAF.

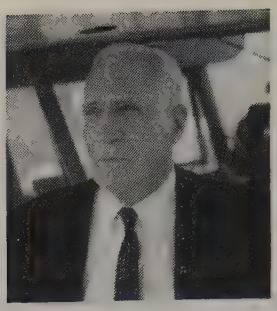
New and unfamiliar chemicals, like new and unfamiliar airplanes, can cause trouble if you are not acquainted with them.

The use of lacquer thinner to clean up hydraulic fluid and other foreign matter in the aircraft is a dangerous practice. Lacquer solvents usually contain alcohols, ketones, esters and hydrocarbons. Benzene, the most toxic component of the lacquer solvents, has generally been replaced by butanol (butyl alcohol). Here are some facts on the toxicity of benzene and butyl alcohol:

Benzene: The results of inhalation of toxic quantities of the vapor are both acute (severe) and chronic (lasting for a long time), depending upon the concentration of the vapor and length of time of exposure. Acute poisoning results from the inhalation of vapor above 3000 parts per million for short periods of time (a matter of minutes). The effects are rapid. Symptoms include a tightening of the leg muscles, dizziness, excitement, breathlessness and the sensation of pressure on the lower middle part of the forehead. In advanced cases of acute poisoning, the individual becomes confused, hysterical, laughs, shouts, curses, sings and becomes obstinate. Chronic poisoning results from daily exposure to unsafe concentrations over prolonged periods, perhaps weeks or months. Benzene can cause irritation of the skin because it has a defatting effect. (Skin contact should be avoided.) It is highly volatile and flammable and consequently is a fire and explosion hazard. In cases of unusual exposure to the vapors, the individual should be removed from the benzene environment to fresh air.

Butyl Alcohol (Butanol): Breathing the fumes of butyl alcohol can cause an individual to suffer narcosis to a mild degree. (Narcosis is a technical word for a state of stupor such as that produced by narcotics.) Butyl alcohol is considered to be three times as poisonous as ethyl alcohol, and the vapor is more irritating, but less so than amyl alcohol. Butanol can cause dermatitis (disease of the skin) as well as early liver degeneration. The maximum allowable concentration of butyl alcohol in air is 100 parts per million, according to AFP 160-6-1. However, other authorities lower this level to 25 ppm. The symptoms of intoxication are irritation, dermatitis and coughing. Removal from the butanol environment will usually clear up the symptoms. Incidentally, butanol is also a dangerous fire hazard.

The problem of toxic materials is always with you *maintenance people.* Used properly, these chemicals serve you well. But many of them are not so harmless as they look. They must be used for the purpose they are intended, in the manner they were intended, and with full respect for what they are!—AIRCRAFT ACCIDENT AND MAINTENANCE REVIEW—Directorate of Flight Safety Research USAF.



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** Builder W. T. Piper, Pres., Piper Aircraft Corp.; Owner Allen F. Edwards, Jr., Manufacturers' Representative, Detroit, Mich.; Veteran Pilot Jack Gregson, seen on "Wednesday Night Fights" (ABC-TV); Service Manager E. R. Schubert, Gopher Aviation, Inc., Rochester, Minn.*

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What Did He Say?

By Captain Raigh Mason, Stead AFB, Nevada. FLYING TIME per se is not an indication of correct inflight communications procedures. Many aircrews have been using incorrect techniques for years and getting away with it.

An aircraft commander was herding his C-124 down the final approach and as the approach progressed, it suddenly became obvious that he was much too short. He called to the engineer for "takeoff power" and the panel man did just that. He *took off* the power. And the aluminum overcast grated to a stop, considerably short of the runway.

An accident in which communications are a factor may never happen to you. Nevertheless, this type of accident has happened to a lot of experienced flying personnel.

Remember, communications to your crewmembers (oral and visual symbols) are intended to bring out one particular response from them. If they "don't read you," you may become a flying safety statistic. When you order or gesture for a particular procedure to be accomplished, you are assuming that the following job components are clearly understood:

What is to be accomplished?
Who is to perform the action?
When is the action to be executed? (immediately or delayed?)
Where is the action to take place?
How, specifically, is the action to be accomplished?

To an experienced crew, one well coordinated as a team, a word or gesture may convey all of the above components. If flying with an inexperienced or composite crew, however, such an assumption could be very hazardous. You must be certain that your cues, verbal or otherwise, cannot be misinterpreted.

Know the crew you fly with and be sure that you speak the same language. See that everybody "gets the word." develop the right habits and use them all the time. Don't let a short cut in speech be the short cut to an accident statistic!—FLYING SAFETY MAGAZINE—Directorate of Flight Safety Research USAF.

Gyro Acceleration Errors Can Kill You-Experienced Pilots Have "Bought the Farm" on Takeoff; This may be the Reason—

The Airplane Commander looked out at the rain-swept runway, commented briefly on the low, ragged ceiling, patted his pocket to insure his green card was there, and released the brakes for takeoff.

Eight J57 engines screamed for air. The total fuel flow needles wrapped around their dial crazily. The heavy '52 gathered momentum—blowing the runway water into clouds of spray behind the blast of the engines.

Line speed check okay. The needle crept toward unstick. The aircraft commander crosschecked the attitude gyro and was just a little surprised to see a two-bar nose-high indication. He wondered if he had forgotten to set the "little airplane" before takeoff but quickly recalled that he had set it. Looking out at the runway through the rain-streaked windshield he pulled the airplane off. Now he was in the "black hole" off the end of the runway. Damn, he wished there was a light out there—a service station, a motel, a hot dog stand—just a light!

His gaze swept across the panel. The airspeed was accelerating rapidly, the attitude indicator two bars nose-high. Just as his eyes reached the vertical speed needle and he realized it read a descent, the pilot shouted, "Pull up!"

Between his quick reaction and an alert pilot they skimmed over the trees and set the airplane into a climb they could depend upon. Using airspeed, altimeter and vertical speed to establish a definite climb, they went smoothly to 1000 feet. Flaps were started up. Again the vertical speed indicator started to settle below zero. The AC pulled the nose up until the attitude gyro read nearly four-bar widths nose-high. His thoughts were fairly easy to read—if not printable—and were in the general area of "What is wrong with this cotton pickin' attitude indicator?"

The foregoing account is not fiction. It doesn't refer to any particular crew or any isolated case, but covers the reaction of many pilots of high-performance aircraft to "Gyro Acceleration Errors."
They can kill you!

(To prove that the foregoing is not a high performance military aircraft phenomenom exclusively, we suggest a little personal experimentation will disclose that it APPLIES TO ALL AIRCRAFT!)

Intense investigation into the problem of high acceleration effects on the attitude gyro were renewed last winter as the result of an accident that happened immediately after takeoff on a dark night. One possibility that required consideration was that the airplane was flown back into the ground. This was not the only possibility, of course; but it does bring out gyro errors of a magnitude that may not be fully appreciated by everyone concerned.

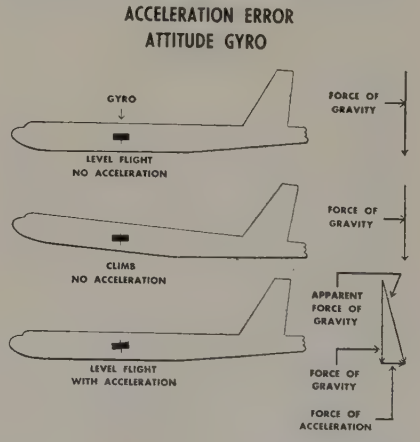
The problem of acceleration error is applicable to all aircraft. It happens to be more noticeable in jet aircraft with high rate of acceleration.

What happens to the gyro to cause it to violate the principles discovered by Galileo and M. Foucault is best *described by the drawing shown with this article. Briefly, however, the axis of the gyro aligns itself relative to the apparent force of gravity. This force is perpendicular to the ground when no other force is applied. But when high acceleration is applied, the apparent force of gravity then shifts by an amount equal to the acceleration rate. It follows then that rapid acceleration will tilt the horizon bar, giving an indication of a climb when no climb actually exists. This error will prevail as long as acceleration continues.

"CHECK UP *another nice save for foam"—FLYING SAFETY MAGAZINE, Directorate of Flight Safety Research, USAF. Pilot of this C-119 with nose gear tire blown after takeoff, requested runway center line be sprayed with foam. (See SAFETY EXCHANGE, SKYWAYS, April 1957)*

(In "clean," high-performance business aircraft, when retracting gear, flaps or on a go-around—CROSS CHECK INSTRUMENTS!)

When airspeed has been stabilized, such as during climbout at flaps-down airspeed, the indicator will give a reasonable indication of proper attitude. As soon as flap retraction starts and acceleration effect is again applied, deflection of the horizon bar is immediately apparent. Unless the pilot definitely establishes climb by cross-check of other instruments, he may actually be descending with a nose-high indication. Even after climb speed has been established, it will take the instrument a short period of time to erect itself to the new, correct gravity force.



THIS DRAWING shows how horizontal acceleration can cause the attitude instrument to indicate a climb when no climb actually exists.

It is evident that complete reliance should not be placed on the attitude gyro for takeoff, since sole reference to this instrument may result in flying the airplane back into the ground.

Although such dangers are considered more probable at high gross weights, it is significant to note that acceleration errors are greater for light weight airplanes. This is easy to figure since the light airplane accelerates faster—applying greater force to the gyro.

The ultimate answer is as old as instrument flying: cross check! "Combat Crew" SAC, USAF.

Instrument Panel Developments To Aid Pilots

Excerpts from a paper

By Captain Edward L. Brown, USAF

The application of the scientific method to problems of flying safety and to the designing of aircraft to better accommodate the human limitations of the pilot is continuously in the research stage.

Capt. Edward L. Brown, Aero Medical Laboratory, Wright Patterson Air Force Base, says that the problems of cockpit instrumentation . . . both as to display of instruments and the design of the instruments themselves . . . present one of the most challenging areas in which to aid the pilot. (See September Skyways, p. 46.)

Many accidents have resulted from the inability of pilots to always fly accurately with the instruments that are present in today's airplanes, Capt. Brown says. The accidents range from those caused by the pilot misreading the altimeter by 1,000 or 10,000 feet to those caused by the excessive time sometimes required by the pilot to transition from contact to instruments when unexpectedly encountering instrument flight conditions.

It is comparatively easy to scan the accident reports and count by the dozen accidents where it is entirely possible that the pilot couldn't use or didn't have the information he needed to prevent the accident. Just a brief list of accidents of this type would have to include accidents such as mid-air collisions, retracting the flaps too soon or too late causing the aircraft to fly into the ground, flying into mountains, landing either short or long, stalling out on base leg or final, feathering the wrong engine, heading for alternates beyond remaining aircraft range, flying into the ground because of vertigo, and landing wheels up.

Efforts are being expended on improving instrumentation systems, however, Capt. Brown adds. As in any new science, the experimental evidence gathers slowly and is sometimes apparently contradictory.

One of the principles of instrument display design that has been developed in the past few years is known as the "Principle of the Moving Part."

A general statement of this principle, says Capt. Brown, is that the part of the instrument the pilot perceives as moving should move in the direction he moves the controls. A part of the evidence in support of this principle is a successful experiment recently completed by Dr. Houston at the University of Illinois under the sponsorship of the Wright Air Development Center.

He used a homogeneous panel in which instruments were modified to operate in conformance to the principle of the moving part. Students used in this experiment had no previous flight experience.

A large-scale instrumentation effort has been going on at the Wright Air Development Center and at Hughes Aircraft Co. in Culver City under AF sponsorship. The Air Force, at both locations, is seeking to develop a new concept of instrumentation.

One of the more obvious features of these panels, explains Capt. Brown, is the vertical instruments used to display velocity and altitude information. Other pioneer companies in the instrumentation field have also considered vertical instruments. The vertical instruments are the engine gage, R.P.M., airspeed and pitch.

One of the limitations of the conventional three pointer altimeters is that for various reasons pilots occasionally misread the instruments by increments of 1,000 feet, or as our jets became more prevalent, 10,000 feet. It is expected that these types of errors will not occur with a vertical instrument because the pilot reads the altitude directly under the index and does not have to check the position of three pointers to know what the altitude is.

Another reason for going to the vertical instruments, Capt. Brown adds, is to permit adding such information as command altitude, heading and speed as well as target altitude, heading and speed. Putting this information on the conventional airspeed and altitude indicators would result in a hopeless confusion of pointers. Since the present-day instrument panel is already so full of instruments that new ones can not be added, there is no choice but to drastically revise our philosophy of instrumentation.

The Hughes panel is designed to operate in accordance with the principle of the moving part. Any movement the pilot makes with the controls is reflected in a movement of the appropriate indices in the corresponding direction. This is the first whole panel application of the principle of the moving part and this program is now to the point where flight tests of this panel will take place in the near future.

Another principle of instrumentation developed to take into consideration the human limitations of the pilot is one concerning the use of pictorial and symbolic displays. This, says Capt. Brown, is an area in which the application of pictorial displays must be very carefully considered. The map-type horizontal situation display is the best example of a good application of this principle.

The only disadvantage of this instrument from a display standpoint is the lack of really precise information for such close tolerance maneuvers as an ILS. It is planned, however, to use flight director type indicators to supplement this map-type display for maneuvers and flight tasks requiring a high degree of precision.

A principle of instrumentation that is probably going to be of major importance to a large number of Air Force pilots during the next few years is the flight director principle. Flight directors, says Capt. Brown, are appearing in aircraft in increasing numbers. The flight directors take into account that one of the limitations of the human pilot is the inability to rapidly integrate several pieces of information and get exactly the right answer every time. The flight director has a computing circuit that combines attitude, heading, altitude and radio navigational information.

Until a pilot actually flies an instrument that does his slide rule work for him, he doesn't realize just how much computing he does during a maneuver such as an ILS, says Capt. Brown. Just keeping those needles centered is a very easy job compared to integrating such information as distance from glide slope and localizer, heading and present pitch and bank and making a guess as to just what the new heading and pitch should be to get back on course and on glide-slope without overshooting and without excessive delay.

Another human limitation of the pilot that has been demonstrated many times in both the laboratory and in-flight situations is his inability to rapidly scan a large, cluttered and ill-arranged panel when he is looking for a specific bit of information. In a series of studies aimed at developing principles applicable to designing instruments for faster check reading, Dr. Grether and Mr. Warrick of the Aero Medical Laboratory arrived at a principle of pointer alignment that is receiving widespread acceptance and use.

In their work, which was primarily concerned with engine instruments, they found that if the various indicators were so designed that normal operating conditions resulted in all the indicators pointing in one direction, an abnormal condition can be spotted far more quickly by the human operator than if the normal jumble of instruments and pointer alignments is used.

Capt. Brown concludes that one of the comparatively untapped sources for further reducing air accidents lies in the further improvement of aircraft instrument displays.

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Maintenance Bulletin

These maintenance notes are compiled and edited from recent CAA air carrier maintenance branch and general aviation maintenance summaries, and mailed to NBAA members as part of their membership service.

AERO COMMANDER

Model 520

Bellcrank Link P/N-5530000-5—The elevator spring bungee attachment link to bellcrank failed. This allowed the spring to fall free. Inspection disclosed that the 3/16" bolt, which attaches the link to the elevator bellcrank arm, was too tight; therefore, not permitting the link to move with the elevator arm.

Model 560-A

Hydraulic Reservoir Access Door—A recent report indicated there is a possibility, when closing door, of the aileron control cable, P/N-5500004, being picked up by the forward latch on the subject door and retained between the latch and skin.

Main Landing Gear Actuating Adjusting Screw—Difficulty was encountered when retracting the landing gear. Right gear suddenly returned to the down position. Investigation disclosed that the retracting adjusting screw, which is attached to the lower end of the retracting piston rod, had failed. The report covers two instances.

Model 680

Nose Wheel Retract Strut P/N-5750039-19—Aircraft lost all hydraulic fluid prior to takeoff. Investigation revealed that the nose strut retract cylinder bottom "O" ring seal had failed. Upon disassembly of the retract strut it was determined that the "O" ring was cut in half by the machined edges on the retract piston. Apparently the wear takes place only when the aircraft is being towed.

Carburetor Fuel Return Line Fitting—Fuel stains were found in area of left wing to fuselage attach point. Investigation revealed the subject line fitting located between the stainless steel shield at the top of engine accessory section and the top skin of the wing had failed. The location of failure is completely enclosed with no provision for normal inspection.

BEECHCRAFT

Model G-35

Throttle Control Assembly P/N-35-94406-600—During flight the control knob and adapter separated from the cable core, where the threaded knob holder is pressed into the end of the core.

Model H-35

Ignition Wire—Difficulty has been encountered, attributed to the exhaust heat melting solder between ignition shielding and spark plug elbows. In addition, deterioration of the high tension lead wire insulation was observed, resulting in missing on the cylinder affected.

Model C-50

Oil Cooler Gasket—Gasket between oil cooler and oil inlet fitting has failed several times. Operator reports correcting the condition by replacing the hose with a more flexible type.

Model E-50

Elevator (left) P/N-50-61000-179—Inspection disclosed crack in top elevator skin immediately aft of spar and inboard of center hinge.

Model D-18-S

Oil Dilution Solenoid Valve—A slow rise in fuel pressure was noticed on one gauge in comparison to the other. Inspection disclosed the "O" ring was not seating properly, permitting a small flow of fuel into the oil system when the engine-driven or auxiliary fuel pumps were operating.

Model E-18-S

Wiring change for brighter lights—The taxi switch is wired to both the 600 and 400 watt resistors which affects the brightness of the taxi light as well as the brightness when both landing light and taxi lights are on. To correct this the ground wire should go to the black terminal on both lights. The LH light wire L3 should go to the white terminal which is for the taxi light, and wire L1 should go to the yellow terminal which is the landing light filament. The RH light wire L6 should be connected to the white terminal which is the taxi light and wire L4 should be connected to the yellow terminal.

BELL HELICOPTER

Model 47-J

Fin Support Bracket, P/N-47-267-455-6—The subject part makes attachment on the rear right-hand side of the fin to tail boom at station 300. In several instances the subject bracket has been found cracked.

CESSNA

Model 170B

Fiberglass Insulation—Fiberglass insulation, which ordinarily is cemented to the instrument cowl extending from instrument panel to firewall, separated. Insulation came in contact with aileron control mechanism, resulting in jamming the aileron in the extreme position.

Model 172

Empennage—During rainstorm the two rear bulkheads filled with water. When pilot and passenger entered plane, aircraft nosed up, resulting in the tail striking the ground. Operator reports drilling drain holes to correct condition.

Model 180

Brake Master Cylinder—Brakes were dragging, resulting from pressure "build-up" in the master cylinder. Inspection disclosed plastic filler cap was not vented.

Model 310

Tube Assembly-Firewall to Strainer (left engine) P/N-0800106-55—Inspection disclosed subject fuel line was worn considerably where it crosses the propeller control.

Bendix Scintilla S6RN-25 Magneto Distributor Cap—Inspection disclosed both magnetos were cracked in cap adjacent to brass bushing. Operator reports cracks developed between 300 to 400 hours service time.

Static Line to Instruments—A recent report indicated that instruments utilizing the subject line for operation malfunctioned subsequent to flying through heavy rain. Water apparently entered the system and froze, making the instruments inoperative.

Landing Gear Actuator Assembly P/N-089-4000-3—Difficulty was encountered in lowering the gear to the locked position. Inspection disclosed right gear tube assembly, P/N-0841135-2, bent. Further inspection disclosed sector gear inside actuator had excessive wear on last ten teeth towards "up" gear end of sector travel.

Model T-50

Truss, Rear Nacelle P/N-54470—Subject part failed at the fitting attachment where landing gear drag strut, P/N-52420, attaches to truss.

CONVAIR

Model 240

This refers to a report where on landing approach with wing flaps set at 21 degrees, right flap came up while left remained down. Supplemental Report. Examination of the right flap drive universal, P/N AN 271B20, Reference CV Parts Catalog, Wing Flap, Figure 9, Index 6, just outboard of the fuselage revealed the universal AN23-25, sleeve retaining bolt and nut were missing. Both universal drive sleeves backed out of the universal block and held in the universal barrel lugs. Clevis bolt is AAL's configuration which replaces rivet through universal barrel lugs, drive sleeves and block. Universal AAL P/N BYC-2157A. This allowed the flap torque tube to move inboard at the flap motor splined joint and universal barrel lugs ratcheted by one another permitting erratic flap operation. Fleet Campaign Directive 331C was issued 7/2/57, to check all flap drive universals for presence of clevis bolts. The FCD was completed 7/8/57, and no bolts missing. Item closed.

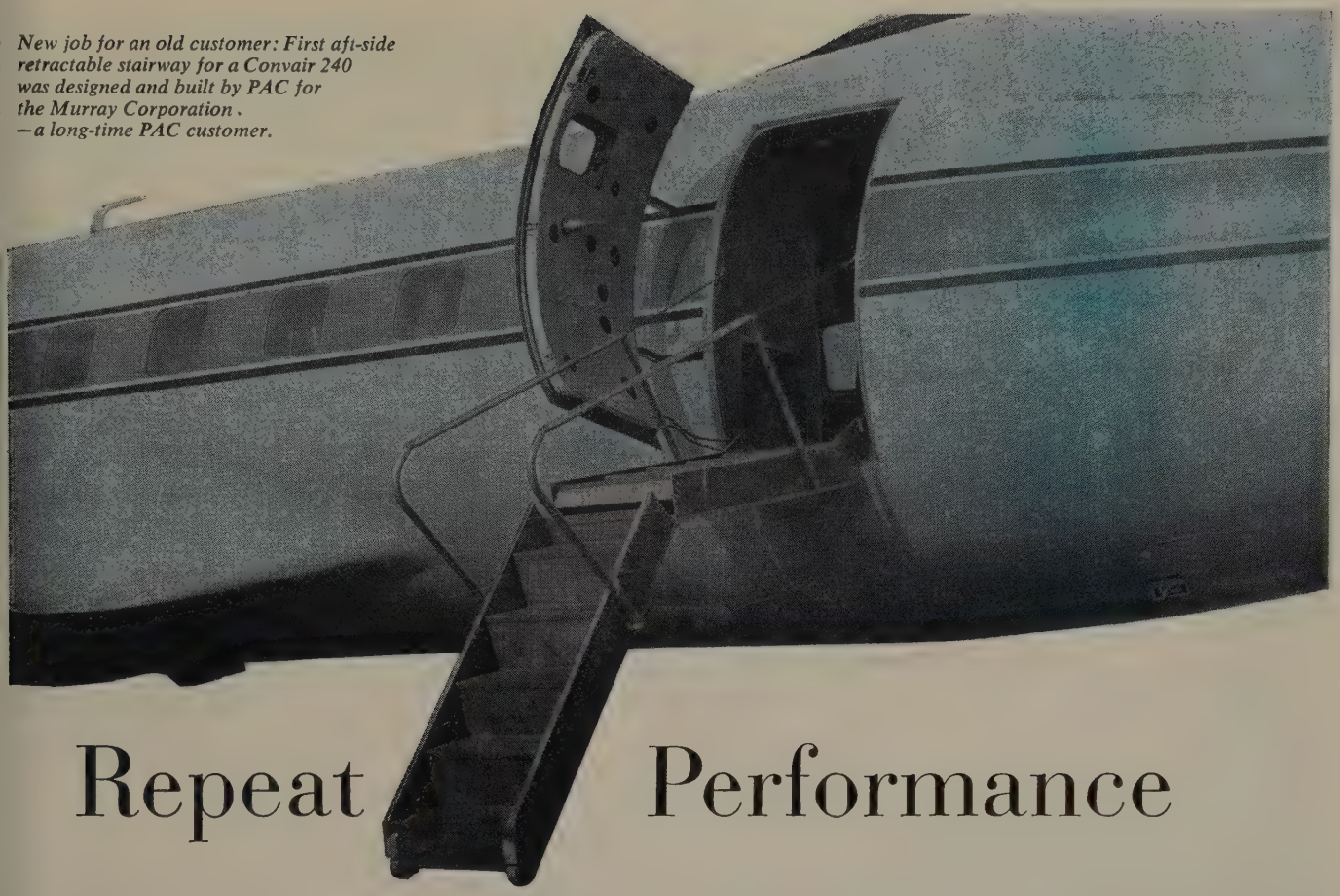
Los Angeles—During routine inspection, found left elevator inboard hinge strut attach fitting, P/N 240-2110712-7, cracked. Part replaced in accordance with Service Bulletin No. 240-440. TT 20,980:00 hours. Item closed.

CURTISS-WRIGHT

Model C-46

Atlanta—During pre-flight, crack approximately 2" long found in right hand

New job for an old customer: First aft-side retractable stairway for a Convair 240 was designed and built by PAC for the Murray Corporation. —a long-time PAC customer.



Repeat Performance

Pacific Airmotive considers its highest recommendation to be the large number of owners and operators who return time after time, year after year, to PAC for aircraft modification, overhaul, and repair.

Operators of executive craft, private planes and commercial airliners are among PAC's valued roster of repeat customers who regularly avail themselves of PAC's complete facilities and highly-skilled personnel.

The retractable stairway for the Murray Corporation's Convair 240 is a case in point. With confidence in PAC gained from prior overhaul, maintenance and repair operations, the Murray Corporation entrusted PAC engineers with a major problem: to design, develop and install in nine weeks the rear-door-mounted flexible stairway illustrated above. Weighing less than 200 pounds, it can be raised and lowered from both interior and exterior control stations. At the same time, PAC performed a hundred-hour check and re-license on the plane; and, in cooperation with Qualitron, Inc., and Aero Interiors, installed an auto pilot and made extensive interior modifications to this latest addition to the Murray Corporation fleet.

In addition to complete overhaul, testing, and maintenance facilities, Pacific Airmotive is equipped for all types of airframe engineering and modification: radio, radar, and hydraulic installation and maintenance, and complete "one-stop" service in all aircraft categories. Production-line techniques and full inventories of factory parts speed delivery and reduce costs.

PAC

PACIFIC AIRMOTIVE CORPORATION

2940 N. HOLLYWOOD WAY, BURBANK, CALIFORNIA

Aircraft flown by typical long-time PAC customers are illustrated below.

Columbia-Geneva Steel Corporation, San Francisco, California

Bethlehem Steel Company Bethlehem, Pennsylvania

Murray Corp. of America Detroit, Michigan

Westinghouse Electric Corporation Pittsburgh, Pennsylvania

Jones & Laughlin Steel Corporation, Pittsburgh, Pennsylvania

BRANCH FACILITIES: CHINO AND OAKLAND, CALIF.; SEATTLE, WASH.; DENVER, COLO.; KANSAS CITY, KAN.; • SUBSIDIARIES: FLIGHT SUPPORT INC., LINDEN, N. J.; PACAERO ENGINEERING CORP., SANTA MONICA, CALIF.; AND PACAIR INC., BURBANK, CALIF.

Military tactics today demand AIR mobility for GROUND forces

The Army H-23C, built by Hiller, is currently in widespread service.

One of the oldest requirements in military tactics is *mobility*. In today's atomic concepts, that means getting the Army *off the Ground*.

So well proved are advantages of the helicopter for Army use that the only big question now is how to reduce operating costs so that *more* helicopters can be used by *more* units!

The Army H-23D now in production and scheduled for delivery this year represents a major step forward in the goal of attaining lower costs through longer service — 1000 hours — between overhauls.

400 HRS.

The Army H-23C

1000 HRS.

The Army H-23D is the first helicopter designed to incorporate the Army's concept of a 1000 hour overhaul cycle on major components.

Engineers: write for opportunities with an industry leader in an ideal California locale.

HILLER HELICOPTERS

PALO ALTO, CALIFORNIA

elevator, P/N 20-130-5701-512 at station 38.5 below the spring tab cartridge bellcrank bracket. Elevator replaced. Undergoing disassembly to facilitate inspection at Miami. Fleet campaign in progress.

Model C-46A

Zyglo inspection revealed crack approximately 2" long in ring groove area of Hayes H-3-38M1 wheel assembly, S/N 38-220, TSO 446:07 hours. Probable cause due to corrosion and pitting. Wheel assembly discarded. MDNX progressively changing over to M-2 wheels. Item closed.

Model C-46F

Fort Wayne, Ind.—Twenty minutes out, right propeller control became inoperative. Normal landing made Detroit. Inspection found bolt holding bearing on end of propeller control quadrant broken. Probably caused by vibration causing bolt to wear. ZATX issued instruction to maintenance department for closer check. Time since last inspection 32:29 hours, TSO 138:29 hours.

DE HAVILLAND DOVE

Model 104

Chafing of Electrical Cables—It has been found that chafing of the electrical cables leading to and from the feathering solenoid can occur by contact with the flanged edge of the flame shield, P/N-4E.1429A/1, when modification P. P. 156 is embodied. It is therefore recommended to inspect the electrical cable leading to and from the feathering solenoid for signs of chafing at the flame shield. Damaged cable should be suitably repaired or replaced. Protection against this chafing may be effected by flattening the flange edge of the flame shield, P/N-4E.1429A/1, against the side plate, starting at the point adjacent to the top horizontal engine mount member, to the lower right corner.

Model DH-104

Lock Ring Retaining Bolts (Reduction Gear Assembly)—Subject bolts (P/N-31394) which retain the sun gear locking ring (P/N-34702) to the front cover assembly on the reduction gear housing were loose. Operator reports removing soft tab washers and installing new steel washers.

DOUGLAS

Model DC-3

Albuquerque—Inspection revealed flare missing. Return flight 83 reported forest fire NNE Silver City. Fire resulted from flare. Flare and chute separated. Inspection Phoenix revealed probable cause one of two spring clips missing from flare release door. Open.

200-hour inspection revealed right forward center section attach angle cracked 2⅛" aft centerline front spar between bolt spot facings cracked ⅝" from angle radius in bolt spot facing. Angle being replaced, angle TT 4825:00 hours. On May 23, 1957, a crack was found in this attach angle located in the web between the spotface holes at the aft spar cap screw at the front spar. This crack dressed out in accordance with special approved procedure dated January 28, 1957, and reported to DACO and CAA. TT on May 23. 1957, 4178:00 hours. Item closed.

During period May 16, 1957, to July 1, 1957, eleven wing attach angles found with apparent crack in unmilled area between bolt heads. Three angles sent to factory.

MOONEY

Model 20

Carburetor Airscoop—Inspection of several subject aircraft disclosed the following discrepancies; misalignment of carburetor airscoop to nose cowl duct, resulting in cracks developing in scoop. Further, the wing to aileron and wing to flap fairing, along upper nose edge of ailerons and flap, chafed fabric.

PIPER

Model PA-22
(Lycoming 0-320)

Crankshaft Oil Transfer Tube—Low oil pressure and high oil temperature were experienced on recent flights. Upon disassembly of the engine the cause was determined to be a broken oil transfer tube between the front main and the connecting rod journal.

Cigar Lighter "Casco"—Lighter handle separated from resistance wire unit. Efforts to dislodge unit from receptacle resulted in a short circuit and blown fuse, needless to say the confusion that was caused in flight.

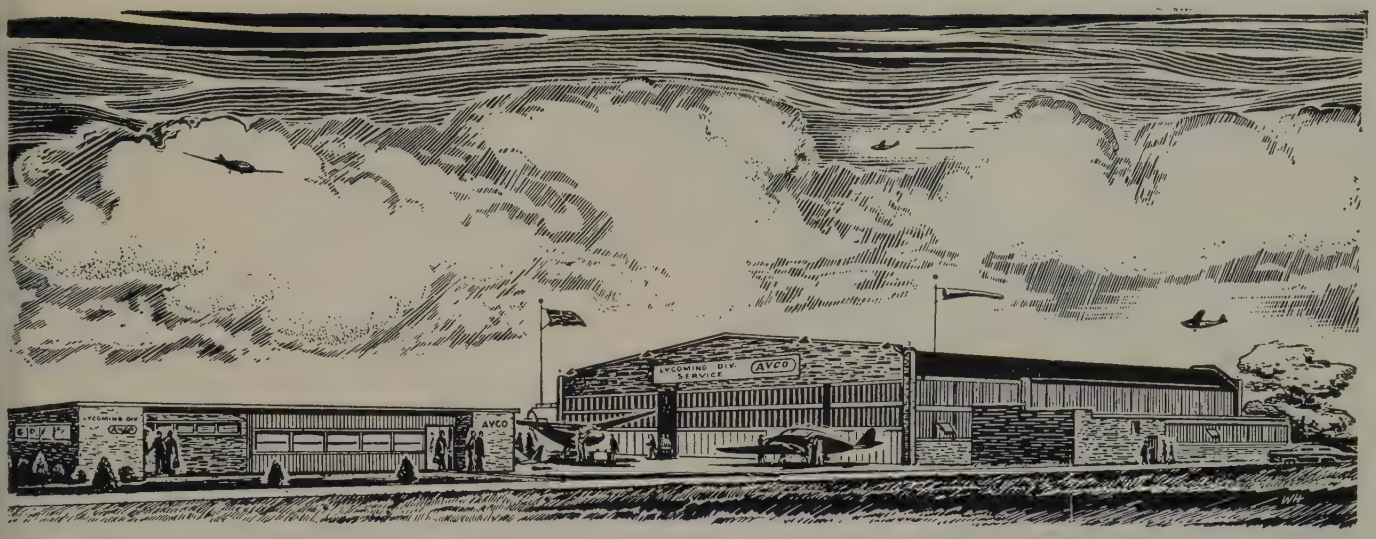
VISCOUNT

Model 754D

This refers to a report that aircraft arrived with left wing flap hanging down, rods and beams bent. Supplemental Report. Further investigation found the nut securing the rear chain sprocket shaft to No. 1 flap beam had backed off. The sprocket shaft then backed out of inboard rib of No. 1 beam. Chain tension then cocked shaft, the chain jumped the sprocket, jammed and broke. Further damage to rods and flaps occurred when flaps were retracted after landing and also when operated by mechanic personnel. The cause of the nut loosening was due to light and ineffectual staking of the shaft threads by the manufacturer. Entire fleet being inspected for similar condition and manufacturer advised of this incident. Item closed.

GENERAL

San Francisco—Numerous flakes of foreign material being found in aircraft fuel tanks and some in fuel system strainers. The material was analyzed and found to be plastic chips from fuel nozzle end protector. Action: All stations advised by telemeter to use care in inserting nozzle into fuel tanks. It appears screens in fuel tanks are shaving material from nozzle. This type of nozzle protector has been in use for approximately 2 years on majority of fuel nozzles. The problem is being investigated in order to determine the type of material to be used in the protectors.



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offers customers complete service at Williamsport, Pa.,

ENGINE SERVICE HANGAR

The Lycoming Williamsport Hangar, established as a service center for all of its engine customers, now embodies adequate modern equipment and is operated as a model engine service center—serving customers from many points around the world.

Working through its dealers and distributors throughout the country, this new Lycoming facility is fully equipped for engine exchange—with either new or factory-rebuilt engines—in the shortest possible time. The hangar is equipped for full CAA-approved inspection.

The new administration and training building (pictured at left above) provides for flight test programs, coordinated with factory engineering personnel and training courses for Lycoming engine operators, as well as operations officers, and pilot facilities.

For full information on facilities provided for Lycoming engine customers, write to Lycoming Airport Service Manager, Williamsport Airport, Williamsport, Pa.

AVCO Lycoming

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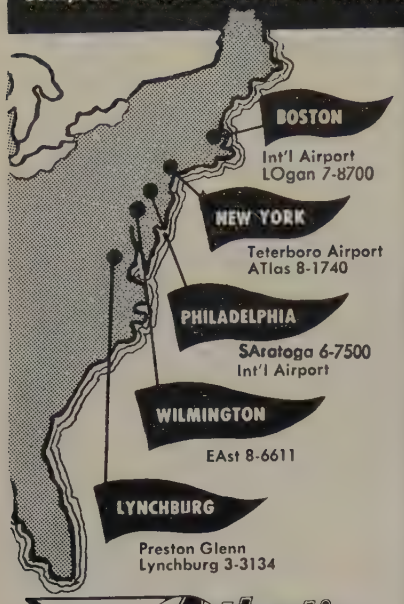
SEE ATLANTIC
complete business aircraft service



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Preston Glenn Airport, Lynchburg 3-3134

Medical Annual Examinations

By Russell J. Vastine, Jr., M. D.

Aviation Medicine

Pilots are in an enviable position so far as their health is concerned, for they are reminded periodically to have their health checked, in order to continue flying. This is actually Preventive Medicine, and as such, should make those of us who fly aware of the many changes that take place in our bodies that can be controlled if discovered early.

Medical men have long been aware of the fact that Preventive Medicine is better than Curative Medicine. This means early recognition of disease processes so that corrective measures may be taken. Cancer can be cured if found early enough. Diabetics can lead normal, healthy lives, if they will only take care of themselves. People with heart disease can live longer if they will seek good medical council.

It is high time, I think, that the problem be looked at sensibly and that pilots begin to appreciate the fact that a wonderful opportunity for maintainence of health is being served to them on a silver platter. Because periodic examinations are required by the powers that be, most pilots shun them. This is probably due to the fact that the medical exam is a potential danger to the pilot's livelihood. The examining physician is not out to ground you. This has never been his purpose. He hopes to be able to maintain your health and flying ability as long as possible, by recognizing changes from your normal health that may be the overture to serious disease.

Why should pilots be singled out for periodic medical examination? This is a just question. It can be answered simply. Flying is a stressful occupation even though pilots will state they are more relaxed when they fly than when they are on the ground. This relaxation comes with enjoyment of the work being done, but pilots are constantly exposed to stresses that are non-existant in other occupations. In order to withstand these stresses, the body must be in good working order. If not, the body reserve is used up compensating for disease and is unable to accept the stress of flying. By disease, I refer to physical and mental deviations from our accepted normal. Something has to give when stress can no longer be compensated for, and it is usually the pilot. He forgets the gear, he forgets the auxiliary tanks, he pilots his aircraft into abnormal attitudes without correcting himself, he makes faulty decisions while on an instrument flight, he has a heart attack, he blacks out, he becomes a statistic.

Doctors are not miracle men. Anyone who poses himself as such is a Quack. We make mistakes just as a mechanic does, but we all try to do our best. We have wonderful devices available to help us find disease. Our eyes, ears and hands along with properly selected laboratory examinations enable us to detect many ailments prior to their giving symptoms to the sufferer, if we are only given the chance. It is true, that after an adequate examination with good health pronounced, a man may fall over dead before nightfall. This has happened, and will continue to happen until our means of detection are even better than they are now. However, we also find that engines quit on take-off just after a 100 hour check.

We measure the worth of a thing by the yield produced. Good safety rules reduce accidents far below the rate expected without them. That's good yield. Good health surveys reduce the "loss due to disease" rate below that found when such surveys are not used. In medicine we cannot always stop disease from occurring, but we can cure it or reduce its toll on one's productivity and pocketbook by slowing down its progress with adequate treatment if we can find it early enough.

What then can adequate medical examination tell us? First, adequate medical examination will tell us if we have any evidence, at the time of the examination, of physical or mental disease, some of which may present no symptoms to the patient. Second, it will enable the examiner to determine the living habits of the examinee and discover any that may lead to disease production, such as heart disease. Third, adequate medical examination will uncover physical defects that develop from time to time that would be detrimental to the flying ability of the sufferer.

What is adequate medical examination? The physician must survey each of the body systems in such a manner as to determine its state of function. This will discover at least 95% of all the ailments known to man. This type of survey is not without cost, both in time and money. I find in my office, that such an examination requires two and one half to three hours. I don't think

(*Continued on page 87*)

Another ARC Flight Proved Product

The Type 210 360 Channel VHF Transceiver. Now available—a high powered VHF Transceiver that permits two-way communication on ALL frequencies likely to be used for many years . . . choice of *any* required frequency for any part of the country, whether you fly under VFR or IFR conditions. Here is extra safety insurance for you and others on today's more crowded airways.

THE SYSTEM:

- **Frequency range: 118.00 to 135.95 mc**
- **360 channels, spaced 50 kc**
- **Weight of entire system: 22 pounds, compact size**
- **Operation: single channel simplex or double channel simplex by pilot selection**

TRANSMITTER:

- **Power output: 15 watts, high level amplitude modulation**
- **SCS/DCS: Transmitter can operate 6 mc higher than receiver in DCS position and on same frequency in SCS control position**

RECEIVER:

- **Sensitivity 2 microvolts at 10 db $\frac{S+N}{N}$**
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- **Automatic noise limiter**

Backed by 29 years of leadership in airborne electronic equipment exclusively, and over 18 months of laboratory and flight testing, the Type 210 assures you of ARC's well known exacting standards of engineering and quality manufacture.

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READING
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Music Relieves Tension

Music in the air? Hard-headed businessmen are recommending it as a means of cutting down ulcer-producing tensions and promoting urgently needed relaxation and rest while rushing from one responsibility to another via plane.

A survey of air passengers at New York's La Guardia and International Airports has turned up some revealing facts about today's "tired businessman" on the wing. The study reveals that rest and relaxation in flight are more important to businessmen than other travelers questioned—perhaps because businessmen find relaxation both rare and more difficult. Half of the men on business flights said they tried to rest or sleep in the air, 40% read (including business reading), and the rest looked out the window, talked with neighbors, etc.

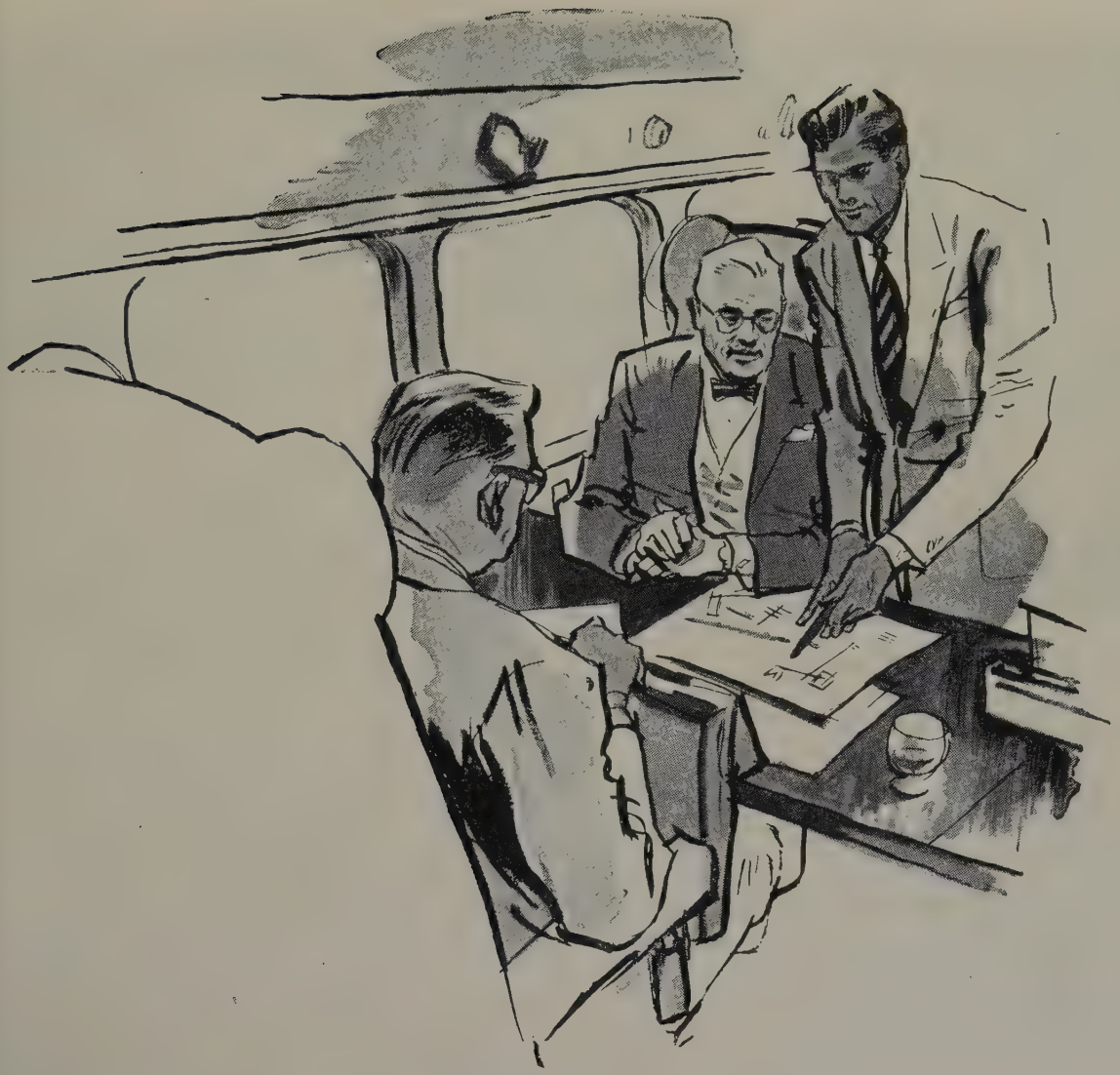
Music in the air was recommended by 81.5% of the people questioned. They said it would "make people feel at home," "calm frightened passengers," and would be "relaxing and soothing." An overwhelming 77% of the men said music would help them relax, and of these men, 44.5% were on business and more than 40% flew at least once a month. Significantly, 63% of the men who wanted music in flight were making short domestic flights—less than 1,000 miles.

The ability of properly prepared and programmed music to relax people and reduce boredom, monotony and fatigue while keeping their efficiency high has been demonstrated in nearly every type of industrial and office work. It has been proved, further, in tests spanning thirty years. However, the application of specially arranged, recorded and programmed music designed exclusively for background use is something new for aircraft. For instance, "Travel Muzak," produced by Muzak Corp., carefully prepares its arrangements to eliminate the distracting elements commonly found in juke box and phonograph record versions of popular tunes —elements such as vocals, unique, attention-demanding orchestral combinations or bizarre instruments. The tunes, especially recorded for background use, when properly programmed, provide a pleasant atmosphere to relax the most harried businessman and, at the same time, a matrix of melody which screens out distracting sounds and is conducive to work.

More than 200 commercial airliners

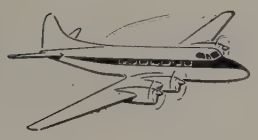
(*Continued on page 86*)

APPROPRIATE *background music adds a luxurious tranquilizing touch to travel on Western Airlines' "Californian" flights. Here Western's Service V.P. Marvin W. Landes shows stewardess Maxine Gordon the heart of the "Travel Muzak" system. Tape is a pre-recorded dual track on a 7" reel. Machine is fully automatic, operates through a remote switch.*



A comfortable office *on wings*—

the new executive HERON®



Four-engine security can be had without operating a large and costly aircraft.

For the private owner or the business house, there is a four-engined aircraft of moderate size and remarkable overall economy—an airliner in miniature.

The executive Heron seats 8 passengers in comfort—indeed luxury—and is suitable for stages up to 1,500 miles.

The Heron is a de Havilland product throughout, powered by four de Havilland Gipsy engines and de Havilland feathering propellers.

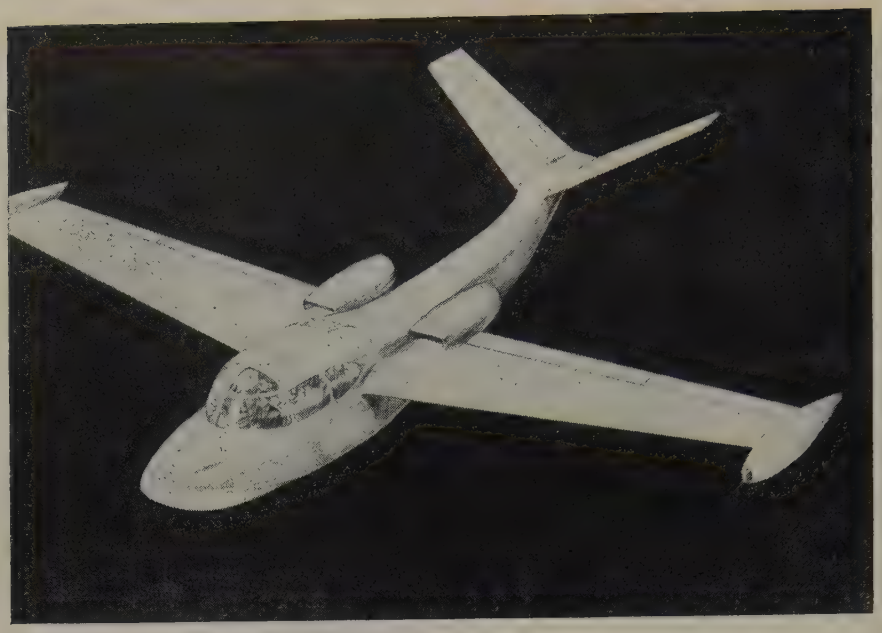
Large numbers of de Havilland multi-engined executive aircraft are operating in the United States and throughout the world.

DE HAVILLAND AIRCRAFT INC.

Marine Air Terminal, La Guardia Airport, Flushing, New York, N.Y. *Defender 5-3370*

Factory-scale overhaul, servicing and spare parts facilities are available in U.S.A. for the Heron airframe, engines and propellers.

Factories in England, North America and Australia. Distributing and servicing organization throughout the free world.



The ANSER—
for corporate flying

by
Captain Chuck Banfe

In a small, chalk-white building in Sepulveda, California, is the mock-up of a twin-jet which pokes its head over the horizon of the Jet Age as the answer for business needs.

It is the ACME "Anser," designed for land, sea and snow operations. It is being built by its designers, a spunky group of engineers, from every major airframe company in southern California.

Started originally in September, 1954, the Air Craft Marine Engineering Corporation moved from ideas only to the design board, penciling in all of the advanced ideas of research brains.

Bob Berns, design engineer with Lockheed Guided Missiles Division, held the reins of the group. They worked in their off-time until they conjured what was mathematically ascertained as the most advanced, most efficient, most everything jet aircraft on a piece of drawing paper.

They searched for a name for the plane and popped up with "Anser," after a genus of ducks.

According to Berns, the "Anser" will be the "answer" to all corporate flying problems in the coming Jet Age. It is a jet for speed, 8-passenger or cargo-carrying for utility, amphibious for mobility, and incorporates all of the proved but heretofore unused concepts of advanced design.

For example, the "Anser" has a remarkable ten-to-one speed range. It stalls at 35 mph, lands at 40 mph, and cruises at over 400 mph.

"It sounds like a lot of aircraft," Berns agrees, "but with our boundary layer control development program we'll actually be able to fly this aircraft at safe, sustained flight at 45 mph. Our speed range of ten-to-one has only been exceeded by the X-2 and some other research aircraft."

The "Anser" will be a true short take off and landing (STOL) aircraft. It will be able to meet the specifications of taking off in less than 500 feet before going over a 50 foot obstacle. Actually, 300-350 feet will be the normal takeoff run for the "Anser."

It will climb at 1200 fpm at full gross weight at 160 mph.

The "Anser" will have a range of 1600 miles and operate in and out of areas of rough terrain, water and snow.

Its cruising altitude will be 18,000 feet with a cabin pressure of 8,000 feet.

The "Anser" will carry 8 passengers —3 seated across the back, 3 across the middle and two pilots in separate, fully articulated airline type front offices.

The cost per mile will probably run about 25% to 30% more per passenger mile than comparable light twins, but the "Anser" will cruise at double the speed.

ACME engineers are quick to point out that this is no oddball aircraft. It doesn't pretend to be a miracle aircraft. They have simply taken advantage of all the millions of dollars of research they have been exposed to and implemented it *now* in one neat package.

Their ideas run the entire length of design from the slickest faring to the pilot's level in practicability.

(*Continued on page 68*)

McMillan all-weather radome assembly "kits" are obtainable through these recognized aviation supply distributors. Call or write the one nearest you for more information.

IN NORTHEAST —
Reading Aviation Service
Reading Municipal Airport
Reading, Pennsylvania

IN SOUTH —
L. B. Smith Aircraft Service
Miami International Airport
Miami, Florida

IN SOUTHWEST —
Associated Radio Company
Love Field
Dallas, Texas

IN MIDWEST —
Minnesota Airmotive Inc.
Wold Chamberlain Field
Minneapolis 23, Minnesota

IN WEST —
AiResearch Aviation Service
L. A. International Airport
Los Angeles 45, California

McMillan

McMILLAN INDUSTRIAL CORPORATION
Brownville Avenue • Ipswich, Mass.

This McMillan radome assembly was specified by both Capital Airlines *and* Vickers-Armstrongs!

In selecting a radome assembly for the famous "VISCOUNT" both Vickers and Capital sought a manufacturer with *two major qualifications* – long experience in radome design, development and production, and superior electrical testing facilities, for guaranteed performance.

They *both* specified McMillan.

In the assembly illustrated above, McMillan supplied a complete "kit" including the radome, microwave absorber material (type "T") and backing, plus the necessary hardware to affix them. McMillan made two radome designs – Honeycomb Sandwich for X-band and Solid Laminate for C-band. The unique hinge design of the mounting hardware affords easy maintenance and repair of the radar equipment.

Aircraft manufacturer – commercial airline – private aircraft owner – each can take advantage of these same "major qualifications" offered by McMillan.

For your nearest McMillan Radome Assembly "Kit" dealer, see opposite page.

McMillan

McMILLAN INDUSTRIAL CORPORATION
BROWNVILLE AVENUE • IPSWICH, MASSACHUSETTS

The Pilot's Eye Through Weather —Radar

Radar, the all-seeing device with many applications, is proving more and more useful as a weather eye on aircraft.

Airborne radar has certain obstacles to overcome to be operative. It must be protected from weather elements and the stresses induced by maneuvers of the airplane.

Various types of protective coverings, screens and windows were pioneered at the M.I.T. Radiation Laboratory under the direction of Edward B. McMillan. These protective devices are known as "radomes."

The prime considerations in radome design and manufacture are transmission efficiency and structural integrity. The radome must be basically classified as a component of the basic radar set, for without an electronically clear, well-designed radome, radar cannot operate within design capabilities.

The case of the airborne radome brings forth the strength-to-weight consideration. The radome must have structural characteristics equal to that of an aluminum structure and yet be light enough so as not to increase seriously aircraft weight or decrease performance. Fiberglas reinforced plastics provide a material answering all requirements for airborne radar window applications for use at speeds up to and in excess of Mach 1.

When the Armed Forces released their rigid control of radar, all phases of the aviation industry were quick to realize the vast potentials of this latest electronic marvel. Heretofore, low frequency radio had been the only contact between plane and ground during adverse flight conditions. Later VHF overcame most communications problems, but it was up to radar to provide a *visual* reference for the pilot.

One major airline undertook the responsibility of conducting a number of technical and operational flights using radar for weather and ground mapping. The success of these flights was soon known and the race for airborne radar was on. First users of radar made many sacrifices for the privilege of flying with this revolutionary equipment. Radomes were crude plastic noses, often not matching aircraft contours and not offering optimum transmission efficiency.

In 1951, the McMillan Industrial Corporation was founded, dedicated to the production of radomes and microwave absorber material.

The window area thickness and method of construction are determined after considering the radar frequency (X or C Band) and the operational characteristics of the aircraft. For example, should a radome be required for a C Band radar installation on a transport type aircraft, the C Band wave length (5.5 centimeters), the reflective coefficient of the window material, the loss tangent and angles of incidence as governed by the required contours are figured together to mathematically arrive at an optional window area thickness. For a C Band (5400 mc) installation, this thickness would be approximately from 0.040 to 0.090 inches of Fiberglas reinforced plastics, depending on radome contour. A similar installation utilizing X Band (9375 mc) radar would require a radome window area thickness of 0.300 to 0.400 inches.

Fiberglas reinforced plastics, although light in comparison to strength would make a very heavy, unwieldy radome if a large nose cap were made of solid laminate with a thickness in the 0.3″ to 0.4″ range; therefore, a sandwich construction would be used. An X Band sandwich would consist of two faces of thin solid laminate with a filler of either foamed in place expanded plastic or honeycomb structure approximately 0.2″ to 0.3″ thick.

After the desired thickness has been determined by electrical considerations, it then becomes necessary to compute the rigidity of the structure as related to flight loads. The most severe forces imposed on a radome in flight are buckling, edge compression, shear and overall bending. These loads may be computed using the known values of the Fiberglas/Resin combination to be used and the dimensions and configuration of the radome.

Radome configuration is determined by the basic aircraft contour and the swept volume required for the radar antenna to be used. There may be modifications in contour to accommodate large antennae or to minimize electrical refraction, but every effort is made to make the radome as inconspicuous as possible and to maintain areodynamic continuity of fuselage lines. In most instances, the general appearance of the aircraft is improved when a redesigned nose cap is installed, and often an increase in operational efficiency is realized. In no case does the installation penalize performance or adversely affect flight characteristics.

When radome design has been stabilized, a method of attaching the plastic shell to the fuselage must be determined. Attachment must be capable of withstanding all flight and landing loads, as well as being easy to operate and dependable.

Often, when designing the attachment hardware, it is feasible to incorporate the bracketry necessary to mount the radar antenna itself. A typical installation will allow inspection of the radar antenna assembly in less than one minute after access stands are in place and will require at the most but one hand tool, a screwdriver, to open all latches. If it is necessary to inspect or service any component aft of the antenna bulkhead, access may be obtained in an additional minute with the only tools required being those used to disconnect waveguide and electrical plus. The photo shows a complete DC-3 kit with the radome hinged to provide easy access, enabling quick, practical enroute stop line check and maintenance.

DC-3 HONEYCOMB RADOME *is hinged for easy access. The microwave protective absorber is shown attached to entire bulkhead.*

All plastic laminates are subject to severe damage through erosion in high-speed flight through rain if unprotected; therefore, it is necessary that exterior plastic parts be adequately protected by coatings resistant to erosion. This protection can be by means of neoprene or epoxy based sprays, some commercial enamels, or by use of a flexible "boot." Coatings containing metallic based pigments would not be satisfactory due to electrical considerations. Consequently, any type of coating not listed above must be electrically tested to preclude any possibility of radar interference. Skin-molded anti-icing techniques could be an example.

(*Continued on page 86*)

Fisher discusses with Donald W. Nyrop, NWA President, and Frank Judd, Vice President — Operations & Engineering, (L/R), their new DC-7C fleet, which uses Champions in world climatic extremes of 100° above to 20° below.

Another in a series on the care taken by leading airlines to maintain top flight efficiency—and why this care has led them to select **CHAMPION SPARK PLUGS.**

Noted aviation authority reports on

NORTHWEST Orient AIRLINES...

Airmanship along the Northwest Passage

Once there was just air. Man came. He built a ship, conquered air. Air . . . man . . . ship. Cast in the master mold of Northwest Orient Airlines experience, this triumvirate of basic, vital elements became *Airmanship.*

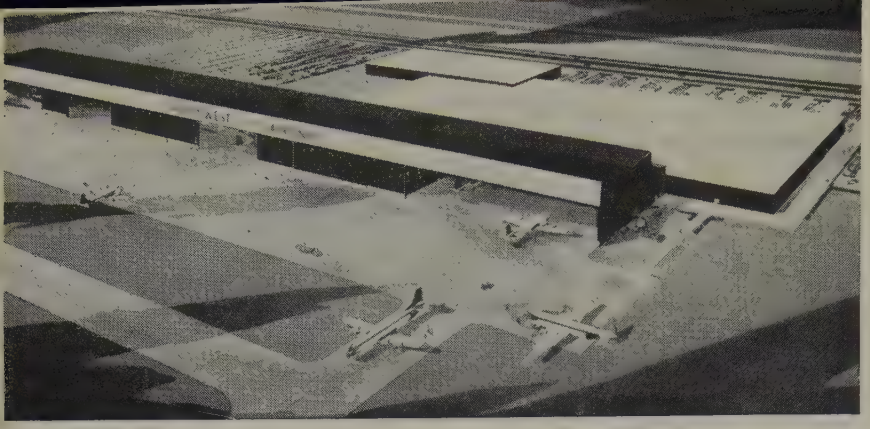
How does Northwest define the new element it fired to perfection in the fusion of these three basics?

Airmanship is the knowledge and skill in all things pertaining to the operation, maintenance, management and safety of air transportation and the achievement of the highest standards of public service.

Northwest has it. Northwest pioneered it, built a long-dreamed Northwest Passage with it—a passage to the Far East with a luxury and safety the men who sailed the St. Lawrence never envisioned possible in their wildest moments.

With these thoughts, I watched Northwest Airlines' president, Donald W. Nyrop, trace NWA's routes on his office map . . . from the concrete canyons of New York City over the Great Lakes and plains, across the piney pattern of Canada and tundras of Alaska; over the Pacific and into the far land of

by HERB FISHER
international aviation authority, veteran test pilot, autho



Artist's drawing of new $18,000,000 NWA Main Office & Overhaul Base at Wold-Chamberlain Field, Minneapolis-St. Paul.

pagodas, lotus ponds and Buddhist shrines. Here is a new Northwest Passage carved from the skies by 31 years of superior NWA Airmanship over land and sea.

Two rented open-cockpit mail planes, three 3-passenger cabin monoplanes and a handful of dedicated employees triggered fusionable elements of NWA Airmanship in 1926.

NWA began exploring its Northwest Passage in 1933 by flying the first commercial plane over the Northern Rockies and into the Pacific Northwest. This Airmanship feat—previously termed next to impossible because of the vast terrain, tricky heights and blizzards—took six days. NWA trail blazers rammed their "tin goose" through furious snowstorms and hair-raising downdrafts, once dropping 1,800 feet down the backside of a peak near Stampede Pass. Lacking radio and weather reports in those days, they flew visually, inching through unknown mountain passes and skirting peaks, often at treetop level. They fought severe icing conditions and bucked runway snowdrifts. Attaining Seattle, they were soon awarded the *first northern transcontinental route* between Chicago and the West Coast.

In like spirit, NWA pushed on to Alaska . . . became the first airline to link Hawaii with the Pacific Northwest . . . then spanned half the globe in 1947 to terminate its Northwest Passage in the Orient. NWA pioneered the Great Circle route to Japan, Korea, Okinawa, Formosa, Hong Kong and Manila—and has just been cited by the National Safety Council for a perfect safety record: "For splendid achievement in maintaining Orient service for 10 years without a passenger fatality in scheduled airline operations."

During this decade, Northwest planes flew more than 68 million miles to and from Hawaii, Alaska and the Orient . . . crossed the Pacific to and from Japan 4,600 times on regularly scheduled flights . . . logged 1,380,600,000 passenger-miles.

New turbo-compound DC-7C's featuring "Imperial Service," a new concept in luxury, are now going into service on all Northwest's daily Orient runs.

With nuclear impact in the aviation industry then, NWA Airmanship mushroomed to its present stature—71 ultra-modern air transports flying 31,000,000 plane-miles and more than a billion passenger-miles annually . . . 5,651 skilled employees . . . a $30 million annual payroll . . . 20,000 route-miles serving 28 domestic cities plus stations abroad . . . a $76 million annual operating revenue . . . and more than a million and a half satisfied passengers.

Service reliability became a vital requisite for maintaining superior Airmanship. It is reflected today in Northwest's on-schedule precision, aircraft dependability, pilot efficiency, passenger comfort and safety. To assure both service and safety, Northwest operates only the finest in aircraft, the very latest in high-quality parts and equipment. Radar, for example, is one of many navigational devices contributing to NWA's optimum performance.

The pencil beam of Northwest's dual-scope X-band radar paints a sharp, clear picture of weather up to 150 miles ahead. It forewarns minute by minute, day or night, of turbulence, pointing the way to smooth, fast, safe flight.

Backbone of efficiency and reliability in NWA airline operations is maintenance, both line and overhaul. NWA operates maintenance facilities in Hong Kong, Manila, Tokyo, Seattle, Minneapolis, Chicago and New York to assure peak flight efficiency for its fleet of DC-7C's, Stratocruisers, DC-6B's, DC-4's and DC-3's.

When I visited the Northwest Overhaul Base at Holman Field in St. Paul, I saw 1,200 employees forging the quality of superior Airmanship into NWA fleet maintenance.

Airmanship discussed by (L/R) Fisher; L. E. Koerner, Ass't. Overhaul Director; R. H. Zinn, Overhaul Director.

C. G. Magnuson, Powerplant-Accessory Overhaul Supt., and J. A. Zechiel, Airframe-Component Overhaul Supt., (L/R), integrate duties.

July 4, 1917—"I wasn't asleep, I was scared stiff," says Capt. Walter R. Bullock, NWA pilot who today flies Stratocruisers and epitomizes Airmanship with over 30,000 safe flying hours.

Completing subzero flight on Champions (L/R): Capt. Burke Frees, Fisher, Capt. R. C. McLaughlin, Flight Engineer Richard Frye.

NWA's president, Don Nyrop, a former chairman of the Civil Aeronautics Board and CAA administrator, told me this: "All of us here are working together to further develop our company in the highest standards of service, safety and operational efficiency. With this objective, we constantly monitor our programs with regard to the procurement of airplane parts and accessories. Our standards require us to purchase only those products which give us the highest degree of schedule reliability."

As a long-time pilot and veteran member of the aviation fraternity in several capacities—and knowing full well the problems of the air transport industry—I can appreciate the pride Northwest has in Don Nyrop as its president. I've known him personally for many years. He's a young executive who knows firsthand the importance of airline service and safety. He has brought to the airline presidency both vigor and understanding—qualities as essential to over-all airline success as Airmanship is to its operation.

In this daily operation, Northwest runs the gamut of global climatic extremes. "Many of our long-range transports pass through the most varied temperatures existing in the world—all in one flight," said Paul Sanders, Director of Line Maintenance, which is responsible for day-to-day care of the fleet. "Any one of our new DC-7C's, for example, may leave the 100-degree heat of Manila and cruise through 20- to 30-below-zero temperatures as it passes over Alaska to its stateside destination."

This means maintenance technicians must give special attention to engine function each day as they combat over-all effects of high temperature and humidity on one hand and freezing rain and subzero temperatures on the other. Ignition systems in particular are of major concern in these operational extremes. And reliability of components such as Champion Spark Plugs is vital.

"Cold weather starting difficulties from spark plug sources are virtually nonexistent," Mr. Sanders said, "and at the other extreme, starting and operational difficulties from high moisture areas and subtropic climates are also nonexistent."

Northwest has used nothing but Champions—throughout the world and in all engines and equipment—for ten years.

"We've service-tested other spark plugs during this time." Sanders said, "but the plug we adopted as standard equipment always proved superior. We're using the Champion massive electrode type now."

Northwest's fleet goes to Holman Field for progressive overhaul on the average of once every 2,000 flying hours. Engines are completely torn down and reconditioned at intervals of five months or 1,300 to 1,700 hours.

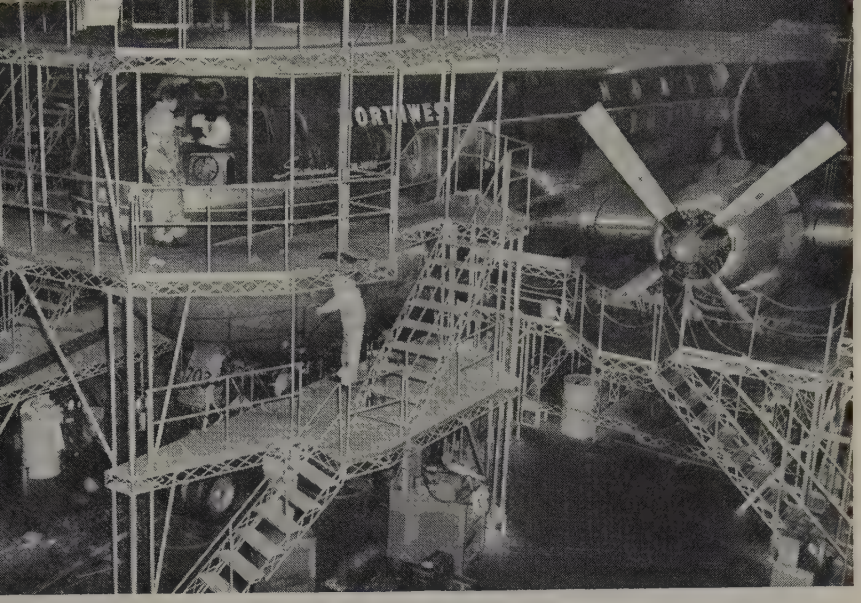
"Spark plugs are one of the chief performance factors in reliability of any engine," said Lou Koerner, senior NWA employee. "We feel that Champion can take pride in a prod-

Through blizzards and tricky heights, they rammed first commercial plane through Northern Rockies to Pacific Northwest. That NWA Airmanship feat opened "Northwest Passage." Famed crew of historic 1933 flight included aviatrix Amelia Earhart. Men (L/R): Capts. Joe Kimm, Hugh Rueschenberg, Mal Freeburg.

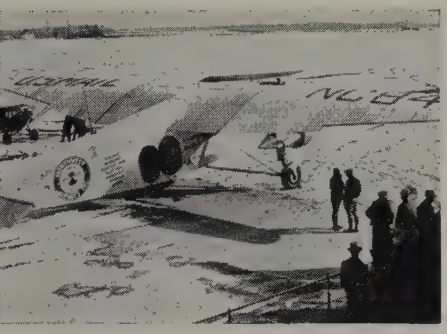
Mechanic Bud Morgan dubs first radar-equipped NWA Stratocruiser "Rudolph with the Radar Nose." Entire NWA pressurized fleet now carries Bendix dual-scope X-band radar.

Tom E. Cooper, Aircraft Engineering Supt., and Leonard P. Larson, Design & Performance Analysis Supt., (L/R), report: "We've used nothing but Champions for 10 years."

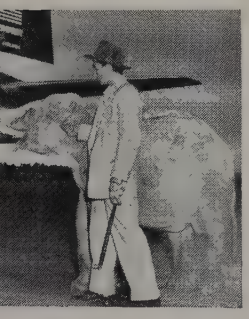
Superior Airmanship skills of Mechanics Norman C. Dinsmore, Hubert E. Gilbertson, David P. Vanarsdall and Clark F. Anderson go into NWA engine.



Special triple-deck scaffolding cages NWA Stratocruiser in overhaul. These $2,000,000 planes are among world's largest commercial airliners.



NWA Ford tri-motor that blazed "Northwest Passage" to Alaska's door.



Circus elephant flies 20th Century "Northwest Passage" to Alaska via NWA. Helpful stewardess is Miss Charmalee Prentice.

iscussing NWA service in Orient, (L/R): Paul H. nders, Line Maintenance & Ground Services Dictor; Fisher; Robert L. Clifford, Ignition Spealist & Ass't. Director; Carl H. Graf, Eastern ight Operations Supt.

uct which has contributed so much to this complex business of operating modern airliners." Mr. Koerner has been with NWA 29 years and knows the meaning of service reliability.

Raleigh Zinn, NWA Overhaul Director, said: "To maintain our enviable airline record of reliability in all types of aircraft and engines, we must have products offering maximum reliability at lowest cost. In using Champions 100 per cent, we've considered initial cost, length of service, cost of spark plug overhaul and the number of overhauls feasible with that plug, plus its thoroughly tested performance reliability."

Perhaps the man closest to the actual mechanics of ignition is Carl G. Magnuson, Powerplant and Accessory Overhaul Superintendent. "A malfunctioning spark plug," he told me, "not only causes engine misfiring and consequent roughness, it also has a detrimental effect on other combustion chamber components. For this reason, let me tell you, we at Northwest are very critical in our choice of spark plugs and in our spark plug overhaul standards. For a decade now, we've found Champions the best in reliability—and second to none in economy."

Judicious economy is wisdom at work in any successful business. At Northwest it's a facet of superior Airmanship as it applies to Management *and* Maintenance.

"Our reconditioning standards are rigid," reported Robert J. Clifford, Assistant Director of Line Maintenance. "Spark plugs overhauled in our shop are of the highest quality." New spark plugs are operated about 360 engine-hours before reconditioning. The reconditioned Champions are returned for another 360 hours of good-as-new performance.

"Champion customer service is of the highest order in helping us solve new problems and in establishing economical operating practices," said Tom E. Cooper, Aircraft Engineering Superintendent. "Champion's effort put into their Annual Ignition Conferences has resulted in tremendous good—product improvement and airline-supplier understanding, for example."

Goodwin I. Luck, Powerplant Engineering Supervisor, summed up my findings at Northwest: "We want the most reliable, safest powerplants attainable in the industry today. That's why we go to all extremes to find the most reliable components for the heart of the powerplant—the ignition system. After reviewing every available spark plug in the industry, we have repeatedly come up with the same conclusion these past ten years: Champions afford us the most advantage."

Goodwin I. Luck, Powerplant Engineering Supt., and Ray Posz, top Ignition Engineer, (L/R), plan engine overhaul.

That advantage is reflected in NWA's transcontinental and trans-Pacific operational record.

And there is more to come with Northwest Airmanship as construction moves ahead on NWA's $18,000,000 headquarters at Wold-Chamberlain Field. This massive structure with 800,000 square feet of work space will house NWA's general offices, line maintenance shops and new overhaul base.

And millions of pleased passengers will continue flying the 20th Century's Northwest Passage to the Far East via the airline that superior Airmanship built—Northwest Orient.

by HERBERT O. FISHER

NAVICOM

(*Continued from page 27*)

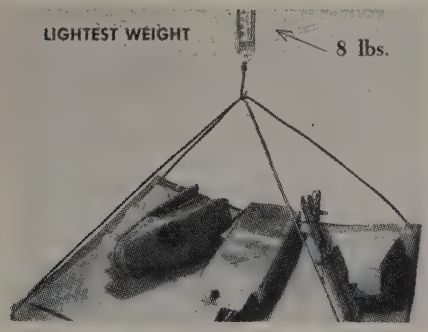
Flying The Easy Way—or— Why "Do It" Yourself?"

The phenomenal increase of the post-war personally-flown business aircraft such as the high performance singles and light twins, has been influenced most by three factors—improved airframe and engine design, improved navigational techniques and equipment and the autopilot.

The complications of marginal weather flying encountered in any high-frequency airplane usage make lone piloting almost inherently hazardous. Add the increasing burden imposed in the rapidly increasing traffic density and theoretically only 2-pilot aircraft could fly safely.

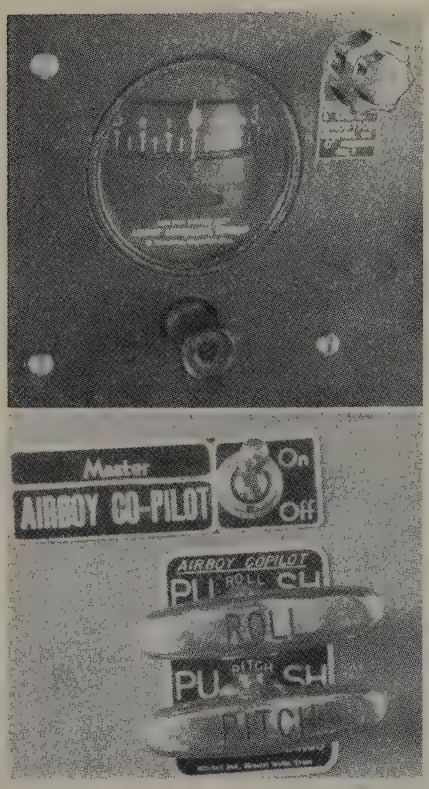
Lightweight autopilots, introduced shortly after WWII, gave early promise of resolving this growing problem. Pioneered by manufacturers of similar equipment for heavy aircraft and jet fighters, the field of small aircraft autopilot devices has been entered by new firms with new ideas, all leading to more simplification, less weight, better control and less cost.

Outstanding in this field is Mitchell Industries, Inc. of Mineral Wells, Texas. An early starter in the field of light-weight navigational and communications radio, Mitchell is now in production on their 3-control Airboy Co-Pilot, claimed to be the lightest 3-axis (8 lbs. installed) automatic pilot on the market. Completely transistorized,



the Co-Pilot embodies all new principles in new circuits. In eliminating tubes, relays, and power supplies, overall size and weight has been minimized yet offers greater dependability, and no warm-up period is necessary. Its electronic design does not affect the vacuum system or create the possibility of the malfunctioning of the necessary flight instruments or engine operation through loss of pressure. The compact simplicity of design reduces otherwise costly installation or maintenance problems. For the first time in an auto-pilot, transistors are used to activate the motors.

The New Mitchell Airboy Co-Pilot is the culmination of twenty odd years of engineering experimentation, and over 3,000 hours of flight checking in the various aircraft; ie, Apaches, Bonanza's (single and twin), Cessna's (single and twin), Navion (single and twin), for which CAA approvals are completed. Compact design and rugged



construction, plus the simplicity of presentation reduces the period of installation to 5 to 10 hours dependent upon the type of aircraft. The cost of installation is in addition to the purchase price and varies with the locale. To offset this, the cost of the conversion of the two instruments is included in the purchase price of $2,150.00, and during the process of conversion the instruments are given a complete check and overhaul.

The Co-Pilot's circuits employ wiring stitched on a module with the transistor. The motivating instruments are connected by the Ensemble Epoxy held cable assembly, with corresponding integral plugs to eliminate possible installation mistakes. The transistor amplifier is of modular construction, whereas the servos are unitized and yoke mounted. All cables are with plugs attached ready to plug into their correct receptacle.

Being completely transistorized, it requires the lowest current consumption of any electronic automatic pilot—1/10 amp. at 12 volts in quiescent condition and 1 amp. at 12 volts only when full control is required. No warm-up being necessary, the Airboy Co-Pilot is always ready for immediate use to take over and hold your chosen heading within one degree accuracy indefinitely.

It makes and holds turns to any degree up to and including 180 degrees left or right with the proper degree of bank, by using the Turn Control Knob adjacent to the Gyro Compass. The Precision Pitch Control Knob used for the elevator control is adjacent to the Gyro Horizon. The positioning of these control knobs adjacent to their respective instruments, eliminates confusion and guess work during difficult flight conditions. Both have vernier control for fine adjustments.

Mitchell Industries are the originators of the Directional Gyro with a Memory, and after thousands of hours of flight and instrument checking have concluded that because of the inane qualities built into present day Gyro Compasses, only one point of the compass could be refined to the satisfactory degree to reduce precision to a practical nullity. Because of these conditions the Zero heading was chosen. The Co-Pilot assists to decrease flight work and relieves hands for radio tuning or frequency selection for transmission.

Disengagement of the Airboy Co-Pilot: Two methods are possible dependent upon the situation present or encountered—(a) momentary soft and easy overrideability facilitates abrupt necessary changes in flight attitudes and direction by physical use of the aircraft controls. When the pilot wants to take over, the transition is soft, smooth and easy; (b) complete and positive disengagement of the Airboy Co-Pilot to all aircraft controls is accomplished by pulling out the engaging handles.

As a final detail to make installation easy, and therefore easy too on the checkbook, Mitchell completes all final adjustments at the factory before the unit is shipped. Since there is no involved electronic equipment, and all the adjusting is pre-done, the mechanic has nothing to do but mount the instruments and plug them in. The two servos —one to control roll and direction, the other for pitch—are mounted directly on the control yoke, and so there are no long cables and long-range control system problems. All its parts are near the center of gravity, and thus there is no trim problem.

It takes a lot of doing to get into this small package all the elements that can think and steer and trim a ship in flight. The Mitchell for example, includes all these essential parts: an effort motor; a follow-up unit that checks on the effort motor, to be sure it is behaving properly; a control-calculating gear train, which coordinates the effort motor and the follow-up unit; an over-riding clutch; a mechanical disengagement cam to free the control from the autopilot when the human pilot says so; an operating rack; a spherical ball connecting the link to the yoke—an exclusive feature containing a spring-loaded ball and socket with a break-away yoke clamp for emergencies. For businessmen-pilots who have been increasingly disturbed about the complexities of solo flight operations, the Mitchell Co-Pilot merits a long, careful look.

Award to Hawthorne's Progressive Flying Club

The 1957 winner in the National Safety Program for Flying Clubs was the Progressive Flying Club, Inc., Hawthorne, Cal. The award was made at the convention of the nation's flying clubs in Denver, July 30th. Many of the clubs registered were composed in part or wholly by businessmen pilots.

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San Antonio-Dayton	1,080 mi.	3:15	331mph AGS
Los Angeles-Akron	2,120 mi.	6:45	315mph AGS
San Antonio-Pittsburgh	1,280 mi.	3:50	333mph AGS
San Antonio-New York	1,590 mi.	4:50	329mph AGS
San Antonio-Daytona	1,050 mi.	3:05	340mph AGS
Denver-Houston	925 mi.	2:50	325mph AGS
San Antonio-Detroit	1,245 mi.	3:40	339mph AGS
Colorado Spgs.-New York	1,725 mi.	5:05	339mph AGS
San Antonio-Los Angeles	1,220 mi.	3:40	332mph AGS
Miami-New York	1,100 mi.	3:05	355mph AGS

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MANUFACTURING DIVISION

P. O. Box 8247 San Antonio, Texas

APOLOGIES TO LYCOMING

In the September issue, a typographical error gave another engine manufacturer credit for Lycoming's air-cooled engines being used in some 70 different aircraft models and in more than 65% of all twin-engine, executive-type aircraft. These engines are Lycoming's.

CAA Wins Ok For Remote Control Radio Station

The CAA has won an okay from the Santa Clara County Planning Commission to place an unmanned station to be operated from Oakland Center.

It will cost $27,000 and will be part of the San Francisco Bay Area perimeter system to relay traffic information to and from aircraft flying at high altitudes on VHF and HF.

At the latest Airspace Subcommittee meeting in Los Angeles certain proposed VOR radio ranges were recommended. They were Gorman, California; Lake Hughes, California; Polvadera, New Mexico; Rice, California; Woodside, California; and Portland. Oregon.

It was also proposed that the L/MF radio range at Santa Barbara, California be discontinued.

Libby Montana airport is to be redesignated as a civil airport, according to the recommendations of the Seattle Regional Airspace Subcommittee. Under further study will be the proposed Victor Airways from Great Falls, Montana VOR Radio Range to the Lewistown, Montana VOR Radio Range and from Redmond, Oregon VOR Radio Range to the Boise, Idaho VOR Radio Range, direct, station to station.

Notams

San Francisco. Tower VHF/DF commissioned on frequencies 118.5, 119.1, 120.1, 120.3, 120.5, 120.9, 121.5, 122.7, 126.18, 126.7, 135.9 mcs. Two way communications on published tower and approach control frequencies only.

Oakland. Oakland tower VHF/DF commissioned this date. Frequencies 118.1, 118.3, 119.1, 120.3, 120.7, 121.5, 122.1, 122.5, 126.18 126.7, 135.9. Two way communications available on published tower and approach control frequencies only.

Long Beach. LGB concurrent with commissioning of Los Angeles BH facility, the identification keying of DOW FM will be changed to Alfa/Dot Dash and LHC FM changed to November/Dash Dot at 48 identifications per minute.

Los Angeles. Los Angeles approach light line sequence flashers available on test basis at pilot's request until further notice. Flashes extend from 1200 feet to 300 feet from end of runway 25 Left. Tower primary air/ground frequency 119.9 changed to 118.9. Route traffic control outbound changed from 118.9 to 119.9.

San Diego. VOR shut down temporarily for modernization.

Burbank. Identification keying of Hollywood hills FM changed to QOT Dot/Dash.

Kaar Engineering Corp.

Kaar Engineering Corp. is currently producing a lightweight mobile radio which is being used by airport service companies for expediting ground services and which is licenseable for ground-to-air communications in the Low Power Industrial Radio Service.

The Kaar IMP, a VHF receiver-transmitter which occupies less than 1 sq. ft. of space, may be used for ground to air communications in the Low Power Industrial Radio Service, between private aircraft engaged in commercial enterprises, and private ground stations, not open to public correspondence.

Kaar Engrg. Corp. was founded in Palo Alto, Calif., more than 20 years ago by John M. Kaar, a pioneer in radio communications. The company began manufacturing "ham" radio transmitter-receiver sets for amateur operators soon after it was organized and entered the marine radiotelephone field shortly thereafter. Before long the company was providing marine sets for yachting enthusiasts throughout the west.

The increased use of two-way mobile radio by police departments caused

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Kaar to experiment with this field of communications during the late thirties and in 1938 the first radiotelephone system produced by Kaar for police use was sold to a Michigan police department. For many years thereafter the organization devoted most of its efforts to the production of this type of equipment.

At the end of World War II, Kaar expanded its operation, adding to the line of marine equipment and concentrating on the development of new and specialized products such as the Imp. The Imp, originally designed to fill the need for a compact and relatively low priced industrial radio, is being used successfully at the San Francisco International Airport, the Reno Airport and other airfields to provide communications between ground service vehicles and the tower or private land stations. Since the Imp uses AM it can be integrated into aviation radio systems.

Today, the organization is continuing to develop new equipment, including a new UHF version of the Imp which can be licensed in the Citizens Radio Service, drastically broadening the scope of applications.

Last year Kaar won the largest contract of its kind ever awarded by the C.A.A. for VHF transmitters to be used for ground-to-air communications with planes flying at above 15,000 feet.

The Kaar plant in Palo Alto now encompasses 40,000 square feet of manufacturing, engineering and office space. The firm was acquired in 1952 by Pacific Associates of San Francisco at which time Norman C. Helwig was named general manager.

Packaged Radar Systems For Business Airplanes

Chamberlain Aviation has developed a packaged radar installation for the DC-3 and Lodestar type aircraft. This package consists of the standard CAIR radome with RCA AVQ-50 transmitter-receiver, accessory unit and antenna installed in the radome. The system is completely wired to a plug for ease of installation and service. A cable is furnished with all necessary plugs for interconnecting the radome package with the indicator, controller and power. All necessary parts are furnished, and with the simplified instructions a complete installation can be made by an average aircraft mechanic within a few days.

This development was made available to meet the requirement of certain large aircraft operators who do not require the facilities of large radar or whose aircraft would be seriously penalized by the additional weight of the large radar.

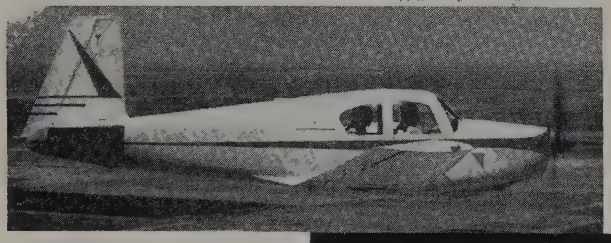
This new development is available as a complete installation, as a complete package in kit form or as a radome kit only, with provisions for mounting the necessary "black boxes." Also available soon, complete radar package kits for the light twin category of aircraft.

Nulls in VHF Antenna Patterns

"It has been observed that some airborne VHF antennas have been installed without proper regard for their proximity to other wires and antennas. For example, a common Beech Bonanza installation includes an omni pedestal antenna mounted on top of the cabin at a point where access can be made to its base through the loud speaker opening. This is a very good spot for the VOR antenna, but one or more low frequency antenna wires running from the empennage to the thermometer post sometimes pass within a foot of the VOR antenna rods. We have found that in such cases deep nulls may appear in the VOR antenna pattern at about —90° from dead ahead, and also at about —150°. The nulls disappear when the LF antenna wires are removed or relocated to a point well away from the sensitive ends of the VOR antenna rods.

"We have also found that locating two or more VHF antennas within a few feet of each other can similarly produce a directive pattern in any or all such antennas, which can result in deep nulls in some directions.

"The effective use of VHF navigation and communication radio equipment depends on adequate coverage in all directions. Therefore we strongly recommend that existing installations be checked for improper antenna locations, and that care be exercised in making new installations to avoid locating antennas so that significant



COMPARE
the Mark 20 with other four-place executive airplanes.
DISCOVER
why the Mark 20 is years ahead in styling and performance.

You get all the advantages of years-ahead styling and performance with the **Mark 20**—the first really new executive airplane in many years.

Mooney wants comparisons. Mooney wants you to be the judge. Yes, you get more in a **Mark 20 . . . ask a Mark 20 owner!** Priced at $13,750.00. Distributors throughout U.S.A. and in many foreign countries.

	Mark 20	Plane Type 82	Plane Type 72	Plane Type TP
PERFORMANCE				
Cruising Speeds (70% h.p.)	165 mph	155 mph	124 mph	128 mph
Engine h.p.	150 hp	230 hp	145 hp	150 hp
Range	900 miles	655 miles	620 miles	525 miles
Pay Load	720 lbs.	679 lbs.	673 lbs.	669 lbs.
Rate of Climb	900 ft./m	1030 ft./m	660 ft./m	725 ft./m
Service Ceiling	17,200 ft.	19,800 ft.	13,330 ft.	15,000 ft.
SAFETY				
Military proven low-wing visibility	Yes	No	No	No
Tubular steel safety cabin	Yes	No	No	Yes
All-weather adjustable engine cooling system.	Yes	No	No	No
Non-fatigue spruce wing	Yes	No	No	No
ECONOMY				
Miles per gallon	20	12.7	15	14.7
Cost per engine hour of operation (Based on engine exchange prices)	$1.00	$3.45	$1.50	$ .93
Fuel cost per mile	2c	2.8c	2.4c	2.6c
Total cost per mile (Based on 600 hours operation per year)	6.6c	9.8c	8.2c	8.3c

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MOONEY AIRCRAFT, INC., Kerrville, Texas

I am interested in ☐ purchasing a Mark 20
☐ Mark 20 sales franchise.
☐ Information on the Mark 20.

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pattern disturbances are produced. In general, if VHF antennas are kept at least 2 feet away from all other antennas, and at least 4 feet from other VHF antennas, the resulting pattern directivity should not be too troublesome."

—Narco VHF Service Bulletin

What's What in Facilities

At a recent Air Safety Forum in the Bay area, Hal Korell, CAA 4th Region Planning Branch in Los Angeles spoke of the radio facilities and future plans on the West Coast.

According to Korell, there are new one-way airways, so successful in the crowded eastern U. S., planned for the San Francisco area. Inbound to San Francisco, on the coast route from Los Angeles, it will be Paso Robles to Salinas to Saratoga Intersection. Outbound it will be San Francisco to Pedro Intersection to Davenport to Monterey to Paso Robles.

The airways east of Castle AFB is to be moved to the west.

Fresno radio range is to be realigned. V-99 to be cancelled.

On the dockets is planned a dual airway from Oakland to Williams.

There will be another dual airways from Los Angeles to Daggett.

Another dual airways is planned from Oakland to Los Angeles.

A new omni has been put in at Woodside, and new omnis will be erected at Monterey, Coldale, Yochi, Conapa, Oxnard, Hector, Richmond, and west of Red Bluff.

In the Traffic Planning program, there will be more people, more radar, and greater peripheral control with a direct controller to pilot setup.

There will be radar in Oakland center, Los Angeles, Denver, and Phoenix by next spring with the other five control centers in the Fourth Region to follow shortly. A new building is being built in Phoenix for Airways Center.

Korell said the jet planning is still up in the air for the CAA still doesn't know how it is going to handle same-altitude traffic when one aircraft flies at 250 mph and the aircraft requiring separation cruises at 550 mph. He warned all of the pilots to be more on the alert in the present over-congested flying areas and to develop safe habits for the jet age.

He said an alarming number of pilots have been filing certain clearances and anticipating the routes when ATC issues the clearance. ATC very often changes the routing due to excessive traffic, and he cautioned all pilots to copy clearances correctly and follow them.

He emphasized that pilots must stay away from restricted areas because of missile firing and traffic.

The old thought that because a pilot has been cleared on an IFR flight plan he is safe is one way ticket downward, according to Hal Korell. He reminded that pilots on an IFR flight plan, flying in VFR conditions are just as responsible for collision avoidance as the VFR pilots.

New A-MP Splices and Ferrules

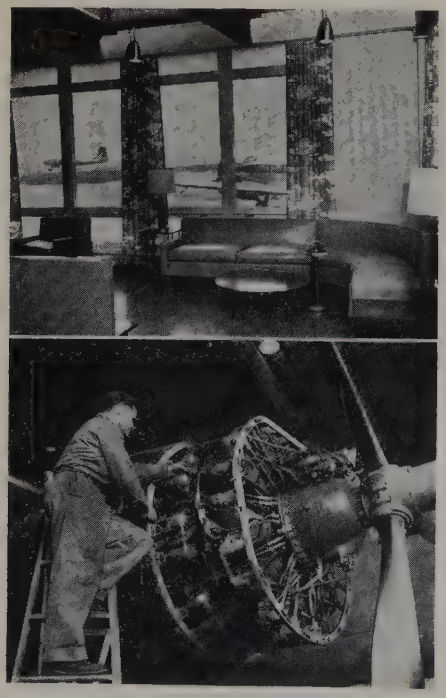
AMP, Inc., has announced a new line of AM-P Shielded Wire Splices and Shielded Wire Ferrules for the aircraft industry. These items were designed to facilitate inspection, and to make possible faster, more compact splicing. Both the splices and ferrules are of one-piece construction, with no loose pieces required to make connection.

Skating On Thin Ice

It took four men from an Air Research and Development Command center just two days to prepare an 11,000 foot runway of ice at North Star Bay near Thule AFB in Greenland. They used pickaxes for tools and inner tubes for runway markers. Two Scorpions and two K6-97 tankers landed successfully on the ice which was thin sea ice. only 49 inches thick.

This was a giant step in the direction of proving that emergency runways can be made in a few short hours almost anywhere in the Arctic.

Coupled with this study will be further tests on an airborne indicator which can detect ice thickness and strength using seismic, impact or electro-magnetic principles.



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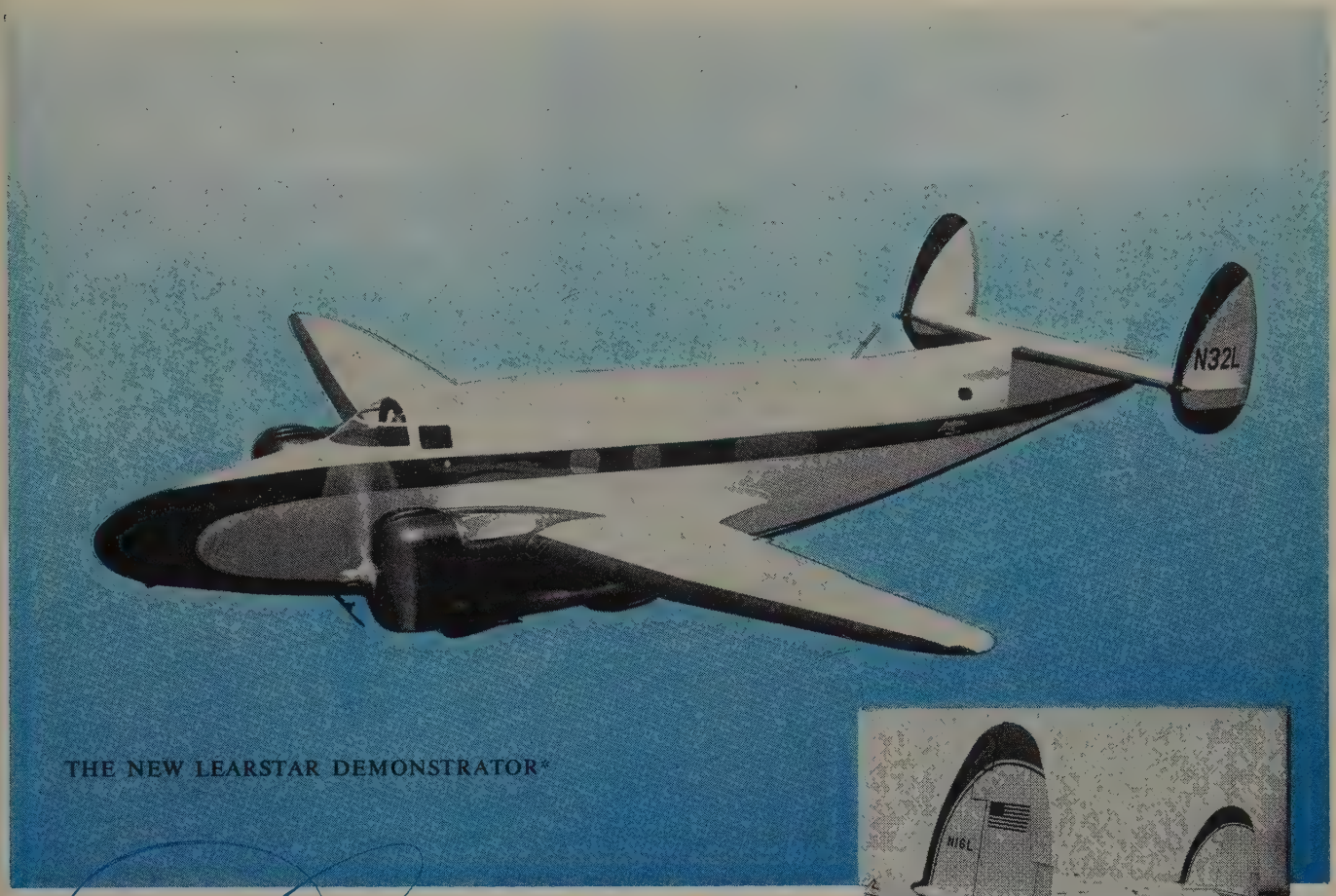

THE NEW LEARSTAR DEMONSTRATOR*

...from LODESTAR to *Learstar* step by step

Any Lodestar in the air today can now be brought up to date under a plan which combines low down-time with progressive modification leading to a complete Learstar. New standards of safety and efficiency are gained, structural reliability is increased, flight characteristics improved, cruising speed increased and range greatly extended. This is the "step by step" program that brings your Lodestar into the famous Learstar class – the world's only business transport that exceeds airline specifications.

Lodestar owners and operators are invited to write for details of PacAero's new "step by step" program explaining how the advantages of airline transport category 4-b can easily be obtained – how your Lodestar investment will be strengthened and how you can take advantage of favorable tax allocations. Regardless of what type of business transport you now own or operate, you will be interested in learning about Learstars now in the process of remanufacture in our plant, and how they may be "customized" to fit your specific needs. And, to provide complete, see-for-yourself details, PacAero's new Learstar* shown above is available for demonstration flight at the convenience of you and your executives. For appointment, please contact PacAero Commercial Sales Division.

PACAERO ENGINEERING CORP.
3021 Airport Avenue, Santa Monica, California
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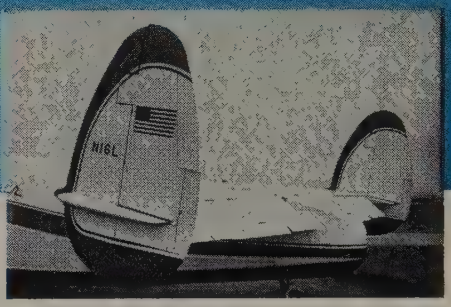
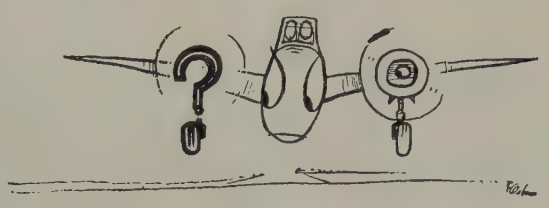


Combination step of Learstar Rudder Spring Tabs and Learstar Wheels and Brakes, shortens Lodestar's legal runway length by 900 feet.

Learstar engines and props step includes 1350 hp Wright R-1820-56A or -72A engines, new Hamilton-Standard 33D50 square tip props, new design short stacks.

Learstar remanufactured wings incorporate additional auxiliary fuel tanks providing total capacity of 1114 gallons. New leading edge configuration eliminates drag, provides greater stability.

AVIA-QUIZ



HAVE FUN AND WIN PRIZES

Readers of SKYWAYS are cordially invited to join in. Avia-Quiz. You don't have to have an "Air Doctorate" to win. All you need is the desire to test your grasp of aviation terminology. It is real fun—and some mighty nice prizes too!

Many companies have assisted in the preparation of the questions. Among these are Bendix, R.C.A., A.R.C. Sperry and others. Acceptable answers to the questions are on file at SKYWAYS office.

A board of five has been appointed to act as judges. Those persons answering the most questions correctly will be awarded prizes; and the method of awarding will be the usual one, i.e., first prize to the one with the most correct answers, etc.

See Page 60

1 At what altitude is it recommended by aero medics that a pilot start using oxygen? .....

2 The beam width in degrees of the ILS Localizer is:
7 degrees ☐ 5 degrees ☐
12 degrees ☐ 9 degrees ☐

3 Carburetor vapor separator is used to: Increase amount of vapor at high altitudes ☐; Remove vapor to prevent lean mixtures ☐; Increase the amount of vapor present to increase combustion ☐.

4 Contrails disappear when the tropo-pause is penetrated.
True ☐
False ☐

5 The heavy black line on the facsimile constant pressure chart is made for any wind velocity in excess of : .....
How many knots? .....

6 What instrument did Lindbergh use as a navigator on his 1927 flight to Paris?
Bumstead Compass ☐
Remote Reading Earth Inductor Compass ☐
Periscope Drift Sight ☐

7 One of the causes of drift in an electrical gyro instrument is:
Insufficient power ☐
Aurora Borealis ☐
Magnetic variations changing ☐

8 A plane weighs 22,500 lbs empty; and 40,000 lbs gross-loaded. Empty, the stall speed is 60 Knots. What is the stall speed at gross?
70 Knts ☐ 80 Knts ☐ 120 Knts ☐

9 The words "Cage" and "Erect" as applied to a gyro instrument mean the same thing.
True ☐
False ☐

10 The various grades of AV Gas may be recognized by their color: 115-145 .....; 108-135 .....; 100-130 .....; 91-96 .....; 80 .....
(Insert color—purple, red, orange, pink, green, blue, brown.)

11 Ten miles of excess airspeed on final approach is the equivalent of approximately how many feet of excess altitude?
100 ft ☐ 50 ft ☐
20 ft ☐ 10 ft ☐

12 What is usual rate at which a modern gyro compass system spins?
9,000 rpm ☐ 24,000 rpm ☐
14,000 rpm ☐ 19,875 rpm ☐

13 On any instrument approach the rate of descent varies with wind direction and velocity. This is:
True ☐
False ☐

14 In precision instrument flying, turns are made by using:
Rudder only ☐ Aileron only ☐
Or, as in VFR, both rudder and aileron ☐

15 The first all-metal, multi-engine airliner carried 12 persons. The plane is known by two names which are: .....
.....

16 A pilot finds himself inadvertently in instrument flight conditions with increasing airspeed. He should: .....
.....
.....

17 What instrument is really a "slip" and "skid" indicator . . . its accepted name being only partially correct?
. . . . . .

18 Formation flying for combat was introduced in WWI by whom?
Lt. Pachtchenko, Russia ☐
Robert A. Little, USA ☐
Lt. Gen. VonHoeppner, Germany ☐

19 Radio-telephone for two-way use in fighter aircraft, standardized independently by both the Army and Navy was a development "first" of:
☐ Stromberg-Carlson; ☐ Radio Corp. of America; ☐ Crosley Radio; ☐ American Bosch; ☐ Aircraft Radio.

20 What was first U.S. air carrier to install all electric auto pilots for scheduled operations? . . . . . .

21 On landing, ground "effect" reduces the induced drag of a plane by what percent?
10% ☐ 25% ☐
50% ☐ 40% ☐

22 Private air mail contracts were cancelled temporarily and the Air Corps ordered to fly the mail in: What month and year? . . . . . .

23 In flying from areas of higher pressure to areas of lower pressure, the altimeter will indicate you are:
Higher? ☐, or, Lower? ☐ than you actually are.

24 Propragation of flame takes place in an aircraft engine when:
Magneto advance mechanism has incorrect timing ☐; Spark occurs between the cap of the plugs ☐; Carburetor backfires ☐.

25 In 1922 the term "radio beacon" was suggested by: ☐ U.S. Coast Guard; ☐ U.S. Navy; ☐ U.S. Bureau of Lighthouses; ☐ Radio Corporation of America.

26 "L" attached to a compulsory reporting point symbol in the Radio Facility Chart indicates a position report must be made only if you are flying below:
What altitude? . . . . . .

27 What properly functioning flight instrument required for instrument flight may indicate the opposite from the airplane's actual attitude? . . . . . .

28 The primary panel for instrument flying consists of: . . . . . .
. . . . . .

29 The first successful blind landing in history was made by: ☐ Bernt Balchen; ☐ Wiley Post; ☐ Jimmy Doolittle; ☐ Charles Lindbergh.

30 What prominent present-day aircraft electronics executive was loaned to Admiral Byrd for the first Antarctic Expedition to supervise installation of radio beacon and aircraft communications and navigation equipment? . . . . . .

31 The first push-button flight across the Atlantic was accomplished by the USAF All Weather Flying Division and was made in 1947 by a:
C47 ☐ Boeing 247 ☐ C54 ☐

32 In a tailwheel type airplane ready for take off, an electrical gyro instrument with power on is not ready for use *immediately* after caging.
True ☐ False ☐

33 Credited with being the inventor of the principle of the helicopter and the parachute is: . . . . . .

34 The first radio beacon was designed and manufactured by Aircraft Radio Corporation and standardized for: ☐ Civil Air Patrol; ☐ Los Angeles Airport; ☐ United Air Lines; ☐ U.S. Army Air Corps.

35 Write 15 words or more: What is needed most in business aviation today?
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

AVIA-QUIZ ENTRY FORM

All entries must be dropped in the SKYWAYS Booth Contest Box not later than noon, Friday, October 4; or, mailed to SKYWAYS, 425 Fourth Ave., New York, N. Y., postmarked not later than October 12, 1957.

Name .....

Home Address .....

City ..... Zone .... State .....

Company Name .....

Company Address .....

City ..... Zone .... State .....

Are you a pilot? Yes .. No .. License # and rating .....

Title or position with your firm .....

Type of business .....

Company plane is a .....

Signature please .....

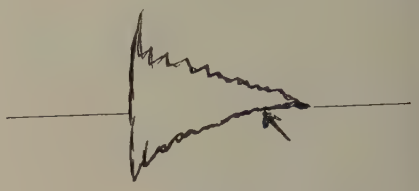
1) Prizes will be awarded at the Convention for winners in attendance.
2) Winners participating by mail will be notified.

PRIZES AND CONTRIBUTORS

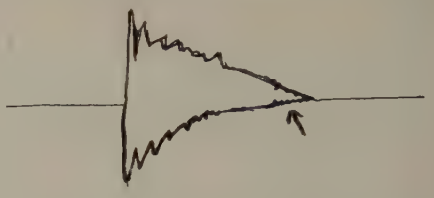
Sperry Gyroscope Co.—Transair Radio Record Player.
Radio Corp. of America—Combination Clock Radio.
Remington Rand Co.—Remington Electric Shaver.
Crown Lighting Corp.—Emergency Evacuation Light.
Oakite Chemical Company—Case of Oakite Cleaner.
Other prizes such as: Portable Radio, Airline Pilot Log Book, and Ray Ban Sun Glasses.

Sperry Engine Analyzer Is Easily "Read"

Typical Sperry Analyzer patterns for the P & W R-2800 Low Tension Ignition System illustrate the ease with which the Analyzer can be interpreted by a flight crew with minimum training.



The "hash," instead of a straight line, shown in the top drawing indicates an arcing low-tension lead. Usually the lead inside the distributor is broken and affects nine cylinders.



In the middle drawing, the "hash" appears (at arrow) on only part of what should be the straight line. This pattern is usually found on 2 to 5 cylinders fed by the same set of points. It indicates distributor plate arcing. This plate can be cleaned up to prevent future engine roughness.

No initial condensor discharge is shown by the bottom drawing. This indicates a bad condensor and is accompanied by engine roughness resulting from one spark plug in nine cylinders not receiving sufficient current.

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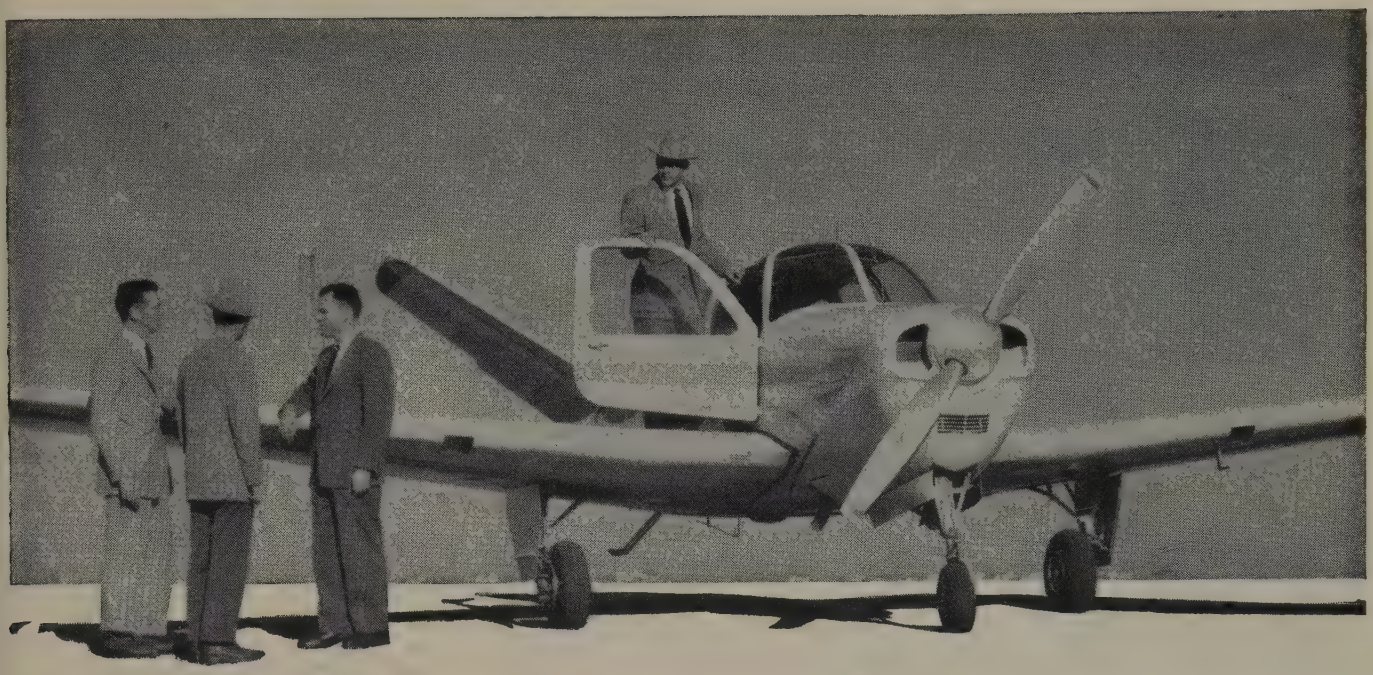
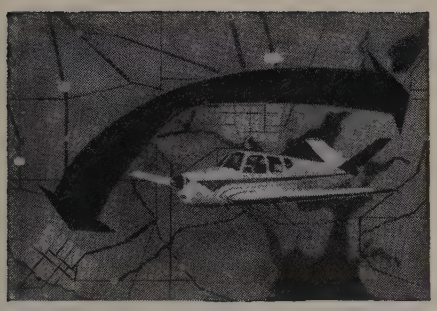


TAKE YOUR TIME

AND STILL DO MORE BUSINESS



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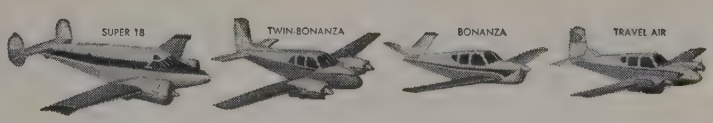
Four-place Beechcraft Bonanza. Range — up to 1170 miles. Speed — up to 206 miles per hour.

Beechcraft



BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Greenhouse Patter

By "Torch" Lewis

PROVIDENCE: Here is a new twist. A municipally operated field where the welcome to the itinerant plane and pilot is just like the service was privately operated. City employees making with the LARGE HELLO and can we do anything to make your stay more pleasant? Makes for a nice taste in the mouth and other municipalities can sit up and take notice.

WHITE SULPHUR SPRINGS: Maybe some day we'll be too old (already gray by the receding temple) for any more of these adventurous takeoffs and landings but until then this place tops them all. This time we landed in the middle of a 180° wind shift and slud to a stop on Oscar Tate's newly seeded 1500′ runway extension. So at last we have a first. By the way, friend Oscar has made 6,000 trips between Roanoke and White Sulphur. He probably thinks that 10,000′ runways like 27R at MIA and 13 at STL are a waste of taxpayers' good money.

BINGHAMTON: Came by in time to see a still smouldering C97 whut landed a little short of runway 34 last night. Nine dogfaces all walked away fortunately, but you'd never believe it to see the bits and bolts. As usual the tail was intact on just about the same spot where a Martin left its main gear last year whilst also learning about landing short. If they keep throwin' airplanes in this here ditch pretty soon it'll be full enough so's you can land short and just make kind of a tin roof noise, but don't this seem the hard way?

DENVER: Here we are visiting the Mile High City and the famous club what all our friends told us about. Hope you fellahs what arrived in fanciful pressurized aircraft were sure to open that valve afore you landed so's you weren't blowed out onta yer tokus when they opened the door. And do not chase no broads in Denver on accounta they is used to the altitude and will plumb wear you see-level pilots out. Let them chase you. Heard that Bill Carrell (CAIR) is to have an iron lung in his suite.

We are also unreliably informed that the real author of "that Playboy article" was Walt Pague in collaboration with Al Capp and Chester Gould.

MUSCATINE IOWA: We've got a trip scheduled there, and I haven't even found it yet. Haven't told anybody upstairs but. My sciatica's been actin' up lately anyway.

Wilbrod sez: "Thems what sez they never been lost ain't flown much."

(Signed) "Torch" Lewis

The President's Executive Aircraft Is A 24 Hour Job

Some corporate pilots complain about never being off-alert. Consider the plight of the president's pilot and crew. They are all sharpshooters as far as the Super-Connie Columbine is concerned, and they are assigned on a 24-hour a day basis—including week ends and holidays. They have to be ready for flight within two hours for any place in the world!

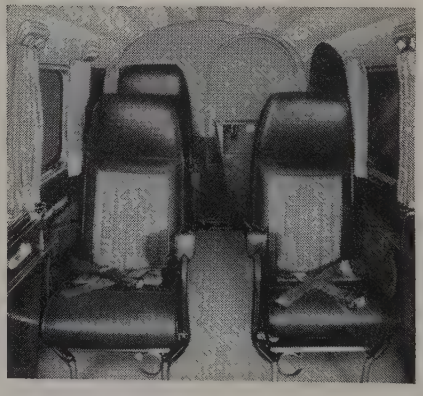
But the maintenance and service would make a continental-bound pilot turn green. For example, the engines are overhauled every 800 hours—not 1200 hours. A Secret Service man is always present when food is purchased for each flight and he hangs around until the cook takes over in the galley. And the food? The sky is the limit! Anything the crew wants the crew gets. They are never lonely, either, for there are eight special guards on board at all times. They are sharpshooters, too.

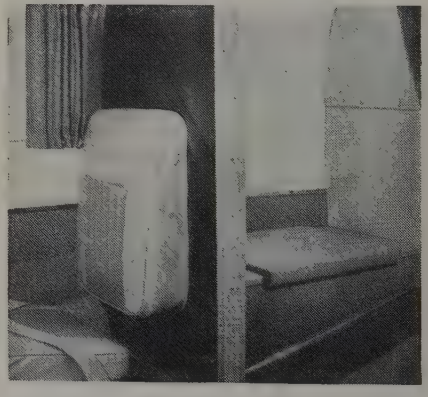
Seattle Lifts Bans on Jets

An eight-year regulation requiring jet aircraft to have prior authorization to land at Seattle-Tacoma airport has been lifted, making that airport one of the first major fields to open its runways to jet transportation.

The north-south runway is being extended to 10,400 feet and is nine inches thick.

MODERNIZE---for Comfort and Convenience





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THE OHIO AVIATION CO. Dayton Municipal Airport

VANDALIA, OHIO • BEECHCRAFT DISTRIBUTORS

12 Years—Flying

(*Continued from page 20*)

Service, Charlotte, N. C., has a capacity of 16 passengers and a crew of 2. It is heavily soundproofed, has plane-to-ground telephone, high frequency transmitter, VHF transmitter, dual ADF low-frequency receivers, dual omni, complete flight instruments on each side of cockpit, crew and passengers-oxygen, JATO rockets, alcohol anti-icing equipment, Janitrol heater, galley, refreshment bar and cedar-lined closets.

Company pilots for this equipment are Jack Ollom, Gene Hebbler and Lyle Arns.

According to J. R. Watkins Co., there are five reasons why business aircraft represent sound economy of time, talent and money.

First on the list is efficiency: Watkins men travel according to their own needs, when and where they please, with no lay-over at connections, no possibility of delay or dispute over reservations; and the businessman traveling in his company's own plane arrives clean, rested and alert.

Second, Watkins estimates a 30 per cent saving in time. Besides being fast, a business flight is comfortable and private. Watkins is also impressed with the safety of air travel, which, according to actuarial tables, is as much as 54 times as safe as driving a car. High-speed air-travel means a trip costs less: fewer meals, fewer overnight stops, less time traveling and more time working.

And a business airplane will economically carry additional passengers, with no significant increase in the cost of travel.

Not least to be considered are the intangible benefits. Maintaining personal contact and active coordination of widespread activities is one of the most important. The value of a company airplane as an incentive tool is also important to Watkins. These days, when more and more people are realizing that the salary check alone often isn't sufficient compensation for doing a good job, travel in a privately owned airplane provides "psychic income"—a little more compensation for one's interest in the job.

The Watkins Co. feels that it would be hard to overestimate the prestige value of their airfleet. Watkins has been able to attract a considerable number of high-calibre men to its trainee programs by describing, among other advantages, the company planes and how they are used. Student contacts made when the Watkins DC-3 was used to ferry college teams to games in neighboring cities have resulted in first choice for Watkins among a substantial number of college graduates.

Altogether, Watkins' air operation adds up to a striking demonstration of how useful aircraft can be to a modern corporation genuinely interested in the human side of business, as well as the more aggressive process of keeping things humming—something The J. R. Watkins Co. has taught itself through 89 years' experience.

H-37 Shines at Yuma Test

Yuma, Arizona. The giant Sikorsky H-37 did extremely well at the Yuma test site.

It was known that the world's fastest helicopter would carry 6000 lb. 100 mi. and return, but the H-37 also chopped the air at 162.8 mph. It has retractable gear. Power is supplied by two 18 cylinder radial engines. The 5-bladed propeller rotor is 72′ in diameter; smaller tail rotor provides stability.

Hot Engine Air Keeps Windshield Dry

Keeping an aircraft's windshield dry while flying in rain sounds like quite a neat trick but the Air Force says it can do it. The technique involves blasting hot engine air over the airplane's windshield.

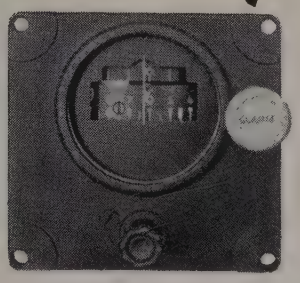
Tests have been successful with a B-66. A similar hot air apparatus is standard on certain fighter planes. The method may be revealed to civilian operators. Besides keeping windshields dry, the system also helps to eliminate steaming windshields on landings.

There is no autopilot on the market today for business aircraft that provides the smoothness, accuracy and trouble-free operation that are yours in the Tactair T-3 Autopilot.

Using time-proven pneumatic systems for both sensing and control, the Tactair Autopilot is far superior in every respect to electrically-operated systems. No tubes, no power drain, no warm-up—so basically simple in design that maintenance is virtually eliminated. Weighs only 7.3 pounds, easy to install.

With its instantly-adjustable heading lock, the Tactair provides uncanny flight ease when flying VOR or ILS, holding course to the exact degree. There simply is no finer automatic flight system available for business aircraft. Priced at only $2595 (single-engine model) including installation kit. See your Tactair distributor for a demonstration or write for brochure.

Only TACTAIR GIVES YOU DIRECT, PRECISE HEADING CONTROL



To fly any desired heading you merely set the upper card of the Tactair directional gyro, engage the heading lock and the Tactair automatically turns the plane to the desired heading, holds it to the exact degree. No confusing zero-heading on the gyro, no complicated resetting needed for course changes.

Standard rate turns are made effortlessly with turn control knob. And, *coming soon*, automatic altitude control easily added to the basic T-3 unit.

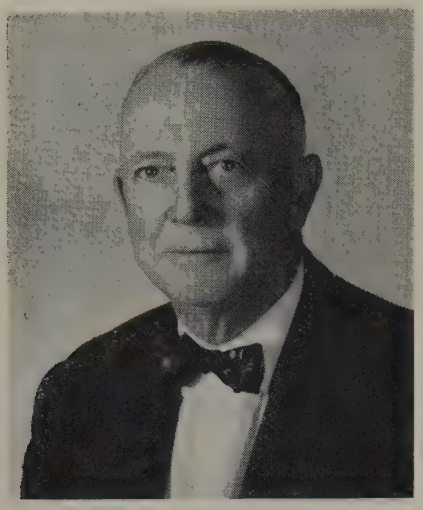
Currently approved on Beech Bonanza, Cessna 180 and 182.
Other approvals to be announced shortly.

TACTAIR INCORPORATED AUTOPILOT DIVISION | AIRCRAFT PRODUCTS CO. BRIDGEPORT, PENNSYLVANIA

For 16 Years Specialists in Precision Aircraft Pneumatic and Hydraulic Controls

Aerojet Develops Infrared PWI As Collision-Warning Device

Avionics Division of Aerojet-General Corp., Azusa, Cal., has developed an



DAN A. KIMBALL, Pres.,

infrared Proximity Warning Indicator (PWI) which detects the infrared energy (heat) given off by the engines of approaching planes.

A research analyst says that the PWI will give each pilot a half-minute's warning prior to any possible collision. A unique scanning system in the PWI continually sweeps 360 degrees of sky.

Weighing about 30 pounds, the PWI unit is mounted in a dome in the nose of the aircraft. Within the dome is a rotating mirror and the instant an aircraft enters its field of vision, the information is transmitted to an indicator mounted in the cockpit. This information is processed on an infrared sensitive photo conductor cell and an electronics package.

According to Aerojet-General officials, the infrared PWI should give sufficient warning to avoid 80 per cent of the midair collisions which occurred last year.

Titanium Blind Bolts

Blind bolts manufactured entirely of Titanium are being produced by Hi-Shear Rivet Tool Co., Torrance, Cal.

Under development for over five years, the bolts in stainless steel and aluminum alloy have found wide acceptance for structural and repair applications. This fastener was designed primarily for normal blind applications, where the work is acessible from only one side.

The blind bolt consists of three pieces: a core bolt, threaded expander nut which resists installation torque and locks the core bolt into place, and a sleeve which expands to fill holes of widely varying diameter. This expansion is reported to give outstanding vibration resistance and makes it possible to use the bolt on honeycomb type materials without danger of deformation.

Sperry Airborne Radar Beacon Possible Anti-Collision Device

Developed jointly by the Air Force and Sperry Gyroscope Co., a compact, light high-powered airborne radar beacon is designed to facilitate aerial refueling rendezvous. As an airborne transponder, the AN/APN-69 identifies and locates the tanker for other aircraft. In combination with the new, light-powerful Sperry APN-59 airborne surveillance radar, it holds promise of an immediately available anticollision system for at least the faster, larger aircraft.

In ideal civil use, if signal strength of the beacon was set for a desired warning range, an alarm device could alert the pilot to adjust the sweep area of his radar to scan all significant airspace around him to spot the intruder's flight path and evaluate the relative danger.

Sperry advises their 5" indicator combines many radar functions of search and surveillance, accurate navigation, weather detection; also anti-collision warning of high terrain, tall structures or of other nearby aircraft.

New Tubeless Miniature Power Supply

Transiply, a new all-transistorized, regulated power supply has been introduced by Kay Electric Co.

W. R. (Bill) Dotter

Chief Pilot of International Harvester Company for over ten years; Member of NBAA; Million Miler with over 20 years of experience; USAF Base Commander, Operations Officer, Chief Pilot, Squadron Commander, North Atlantic, South Atlantic, African, European and South American routes, emerging as Lt. Colonel.*

** International Harvester has accumulated well over two million plane miles.*

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"I am of the firm belief that a complete refresher training program is absolutely essential in the safe conduct of a business aircraft operation, and under no circumstances would we attempt to operate without it."

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for executive aircraft operators

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How Do You Heat Your Airplane?

Ever wondered just where your airplane's cabin heat came from, or complained that it was too hot or too cold?

Information on the "combustion heater," supplied by the Janitrol Surface Combustion Corp., is offered here to enlighten the reader on an otherwise over-looked subject.

Basically, the combustion heater is nothing more than a sealed container in which the flame and hot combustion gases produce heat.

Safety is of primary interest, and the sealed combustion chamber has a background of tests for vibration damage, explosion, all kinds of stresses and strains and complete exploration of temperature distribution with relation of temperature capacities of metals considered for use.

Because the combustion chamber is the heart of the heater, taking the roughest treatment, its design must include provisions for the clean, uncontaminated transfer of the heat from the flame and hot gases to the ventilating air stream. The transfer must be made rapidly and in as small a space as possible. This calls for a knowledge of heat transfer and the fabrication of metals that will accomplish these things.

Figures 1, 2, 3 and 4 show four basic aircraft heaters with combustion chamber and heat transfer surfaces. The shaded areas mark the location of the flame and hot gases. The white areas around them are where the ventilating air flows and "picks off" the heat from transfer surfaces.

The flame stops at the end of the tube in which it originates, so that only hot gases spill into the exhaust stack.

Air pressure within the areas where the flame and hot gases are is always kept at a lower pressure than that of the ventilating air passing around the outer surfaces of the combustion chamber. Thus, if any one of the sealed passage surfaces is punctured in some way, the flow of air is into the combustion areas, through them and out the exhaust pipe. A puncture has never been known to happen, however.

Each heater must be able to produce sufficient heat for the specific demands made upon it and must ignite and safely burn aircraft liquid fuels regardless of speeds or altitudes.

The combustion heater is turned off by shutting off the fuel supply which in aircraft heating systems will usually occur when the thermostat has been satisfied.

Ventilating air to be heated is ducted from an outside air scoop (or by blower) separate from combustion air. Air control is very important in com-

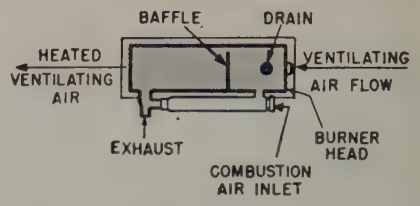

Fig. 1

SINGLE PASS COMBUSTION *chamber and heat exchanger assembly. No secondary heat exchanger passes. Used on 15,000 BTU output heater.*

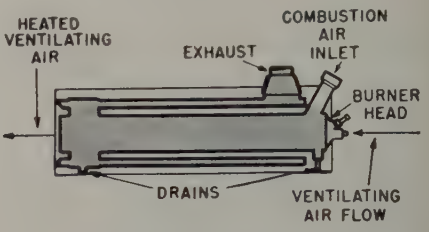

Fig. 2

TWO PASS COMBUSTION *chamber and heat exchanger assembly. One secondary heat exchanger pass. Used on 25,000 BTU, 50,000 BTU and 100,000 BTU output heaters.*

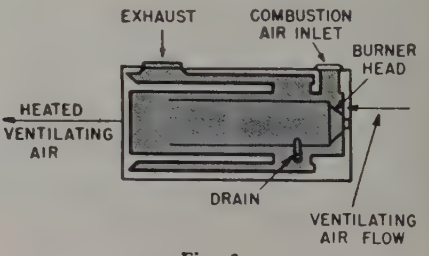

Fig. 3

THREE PASS COMBUSTION *chamber and heat exchanger assembly. One secondary heat exchanger pass. Prime heat exchange surfaces of combustion chambers utilized through even temperature distribution and radiant heat design (Janitrol). Used on 200,000 BTU and larger heaters.*

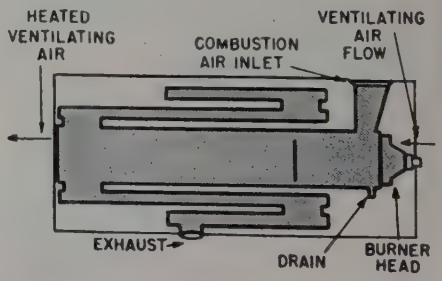

Fig. 4

TWO AND ONE-HALF PASS COMBUSTION *and heat exchanger assembly. Used on 300,000 BTU output heaters.*

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Regardless of the size of your airplane, Bendix Red Bank has a DC generator specifically designed to meet your needs, plus the necessary regulating and control equipment. You can count on these generators for long life, extreme dependability, and maximum performance.

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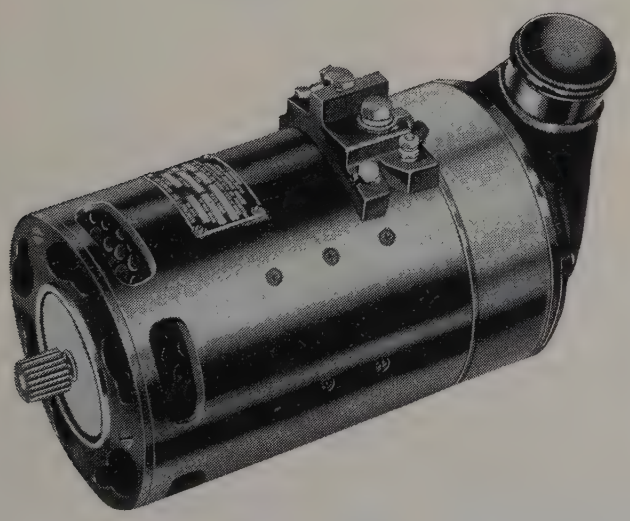
West Coast Sales and Service: 117 E. Providencia Ave., Burbank, Calif.
Canadian Distributor: Aviation Electric, Ltd., P.O. Box 6102, Montreal, Que.
Export Sales & Service: Bendix International, 205 E. 42nd St., New York 17, N. Y.

FIND THE ANSWER TO YOUR NEEDS HERE

AIRCRAFT MAKE AND MODEL	ENGINE MAKE AND MODEL	APPLICABLE BENDIX DC GENERATOR TYPE
Aero Commander 520	Lyco GO-435-C2	30B24
560	GO-480-D1A	30B24
	GO-480-D1C	30B24
	GO-480-C1B6	30B24
680	GSO-480-A1A-6	30B33, 30B24
Beech A45 (YT-34)	Cont E225-8	30B24
H-35 Bonanza	O-470-G	30E22
D-18S & E, 18S super, 18 twin	P & W R985-AN4, AN14B & B5	30E16, 30E01
50, 50B & 50C	Lyco GO-435-C2, C2D6, or C2B	30B33, 30B24
	GO-480-F6, F1A6 C2C6 or C2D6	30B33, 30B24
D-50	GO-480	30B33, 30B24
E-50	GSO-480	30B33, 30B24
G-35	Cont E-225-8	30B24
Cessna 180	Cont O-470-A or K	30E22
182	O-470-L	30E22
190	W-670-23	30E01
305A & B	O-470-11 or 15	30B24
310	O-470-B or M	30E22
321	O-470-2	30B24
620	GSO-526-A	30B33, 30E22-2
Convair 240, 340	P & W R-2800-CA-15-18, CB16-17	30E02
440	R-2800-CB-17	30E02
Curtiss C-46	P & W R-2800-43	30E02
de Havilland Beaver DHC-2	P & W R-985-AN6B	30E16
Otter DHC-3	R-1340-S1H1-G	30E16
Douglas DC-3	P & W R-1830-75 & 94	30E07-11
DC-6	R-2800-CB-16, -17	30E02
DC-7	WR 3350	30E02
Fairchild C-82	P & W R-2800-85	30E02
Grumman Widgeon G-44	Ranger 6-440-C5	30E01
G-73	P & W Wasp 985-53H1	30E01, 30E16
Lockheed Constellation	WR 3350	30E02
Lodestar, Learstar	P & W R-1830-75 or 94	30E07-11, 30E20-11
Ventura	P & W R-2800-83-AM-10	30E02
Super-Ventura	R-2800-83 or CB-16	30E02
Martin 202	P&W R-2800-CA-3, 15-18	30E02
404	R-2800-CB-16	30E02
B-26	R-2800-43, or CB-16	30E02
Piper PA-18-150	Lyco O-320	30E22
PA-23, PA-24	O-360	30E22
PA-22-150	O-320	30E22
Taylorcraft 400, 500	Cont O-470-J	30E22
Topper, Sea Bird	O-470-J	30E22
Vickers-Armstrongs Viscount	RR Dart 510	30E02



BENDIX RED BANK DC GENERATOR PERFORMANCE DATA

TYPE NO.	NOMINAL RATING AMPS.	SPEED RANGE—RPM	APPROX. WT. LBS.
30B24	50	4000—8000	14
30B33	150	4700—8000	28
30E01	50	2200—4500	24
30E02	300	3450—8500	62
30E07-11	200	3000—8000	45
30E16	100	2500—4500	39
30E20-11	300	4000—8000	46
30E22	50	4000—8000	14
30E22-2	(Same as 30E22 Except Clockwise Rotation)		

Red Bank Division

Bendix AVIATION CORPORATION

bustion heaters. The differential air controls that are offered for use with aircraft heaters are selected for their ability to perform the necessary air handling functions.

Nearly all airliners, many executive planes, as the DC 3, PV 1, Loadstar, Martin 404 and Convair 340, and many military planes are using combustion heaters for passenger and crew comfort . . . and, for wing and empennage de- and anti-icing.

ANSER—Corporate Flying

(*Continued from page 44*)

They have designed a full, wrap-around windshield to give the pilot a 360-degree look-see, plus an open, over-head canopy. The visibility will be equal to a single engine jet fighter—the nearest thing to placing a pilot in a crystal ball.

The "Anser" is a high midwing airplane. The leading edge is even with the rear of the cabin.

It measures 38 feet in length with a wingspan of 46 feet.

The cabin will be ten feet long and 68 inches wide. There will be full standing headroom of 69 inches in the center well and 59 inches on the sides.

It will gross out for takeoff at a maximum of 9,000 pounds with an empty weight of less than 4,000 pounds.

The "Anser" will be powered by two ducted twin-jet engines built by Continental Motors from a design of the Turbomecca Company of France.

"More appropriately," said Berns, "the engines are known as Bypass Turbo-fan engines. A turbo-fan engine is arrived at by taking the turbo-prop engine and reducing the blades until they are the size of the engine. Then you keep adding blades so that instead of three or four, you end up with 20 blades of small diameter. What this amounts to is an axial-flow supercharger for the jet engine which is behind it. This increases the pressure ratio and increases the turbine output as well as giving a high mass flow and low velocity. Because the propulsive efficiency is a factor in which the airplane speed is the numerator and the jet exhaust speed the denominator, the turbo-fan is an ideal engine for us."

"What this totals," Berns added, "is a fairly low exhaust speed with fairly low mach number airplane flight speed. This then manifests itself in high propulsive efficiency and high static thrust which is what you need for short field takeoffs."

The "Anser" will burn a wide range of fuels from kerosene through low grade gasoline because it uses a slinger ring instead of a nozzle, thereby eliminating one of the most troublesome parts of a jet engine.

It will have one of the lowest specific fuel consumptions of any engines, burning about 60 gph, especially unique in a jet. Total capacity is 480 gallons.

The engines are set at the junction of the trailing edge of the wing with the engine inlets located above the upper surfaces of the wing. Here they will be protected from spray and snow or rough field materials on take-offs and landings.

The Aspin II engines (Model 420 in the Continental series) weigh 315 pounds each as compared with engines in light twins which spin the arrow at about 475 for each engine with props and control equipment consuming another 105 pounds. The savings in engine weight is 530 pounds.

Most aircraft are stuck together in small pieces and then riveted or welded, but the "Anser" is going to cut down on production costs by being built in large sections.

There will be a continuous one piece outer hull which will be well adapted for water-based performance. ACME will use epoxy resin fiberglass with uncombed cord.

Epoxy resin is a very high stress material getting up to 85,000 psi in tensile and structural tests.

Weightwise, the epoxy resin will compare favorably with magnesium which is about .64 pounds per cubic inch. In addition, the two materials are compatible for assembly.

The "Anser" hull will have the strength and lightness of magnesium with the strength and durability of fiberglass.

The landing gear system is a unique, fully-retractable sponson landing gear combination. When fully retracted the gear presents a completely clean configuration. The front faring is also a

4 Reasons Why - -

●Photo, courtesy of National Aircraft Corp., Burbank, California, shows their Model NA75 powered by Pratt and Whitney R985 engine.

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PORUS - KROME
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PORUS - KROME
Increases Piston Ring Life Up to 50%

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before you buy a so-called autopilot

Does it have . . . ?	Device A	Device B	Device C	Device D	L-2 AUTO-PILOT
COMPLETE 3-AXIS CONTROL—AILERONS, ELEVATOR, RUDDER					✓
PRECISE, LONG-TERM HEADING HOLD, BY DISPLACEMENT (DIRECTIONAL) GYRO		✓		✓	✓
FULLY AUTOMATIC HEADING LOCK—NO NEED TO PRE-SELECT HEADINGS					✓
INSTANTANEOUS SERVO RESPONSE			✓	✓	✓
PROPORTIONAL SERVO RESPONSE	✓	✓		✓	✓
FOLLOW-UPS—PREVENT OVERSHOOT, PERMIT USE OF HIGH-POWER SERVOS					✓
AUTOMATIC PITCH TRIM			✓		✓
ALL-ELECTRIC CONTROLS—NO MECHANICAL ENGAGE-DISENGAGE, NO DELICATE VALVES			✓		✓
AUTOMATIC ALTITUDE CONTROL AVAILABLE					✓
AUTOMATIC ILS APPROACH COUPLER AVAILABLE					✓
THOROUGHLY PROVED—2000 IN USE DURING EIGHT-YEAR PERIOD					✓
CAA-CERTIFICATED FOR ALL LEADING AIRPLANES, S.E. & TWIN (19 MODELS)					✓
YAW DAMPING	✓				✓
VISUAL DIRECTIONAL & ATTITUDE GYRO REFERENCE		✓		✓	✓

This tabulation of essential autopilot features was gathered from manufacturers' specifications, current as of September 15, 1957.

ONLY the L-2 performs *all* the functions of a completely automatic pilot for single engine airplanes and the light twins.

LEAR L-2 **AUTOPILOT**

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speed brake and can be used at all times.

There are no wingtip floats to produce drag, and the sponsons are water static and low speed stabilizers.

The use of boundary layer control gives the "Anser" a lift coefficient of 6.7. Consider that the DC-3 has 1.6 and that is good while modern aircraft of today have 2.6 which is considered excellent, then 6.7 is remarkable.

Another reason why the Aspin II turbo-fan engine is so well suited for the "Anser" is that it is insensitive to air bled off for boundary layer control and very little additional fuel is consumed.

"Boundary layer control as we use it," Berns stated "or 'super-circulation' as it is technically known, is a sucking on the upper area of the wing by means of controlling the air flow separation. Actually boundary layer is nothing more than air going by the wing surfaces at lower speeds increasing the buoyancy. This wing is just what the doctor prescribed for our operation. It is laminar on the upper surfaces to 40% and on the lower surfaces to 70%."

By artificially blowing air over the wing and creating variants needed, such speeds as low as 40 mph (by reducing the drag through unloading the wings) and speeds over 400 mph are possible.

The "Anser" uses a butterfly tail for many reasons including:

1—To get the stabilizer out of the water spray.
2—To get the stabilizer out of the exhaust blasts.
3—There is very little yaw problem in a single engine performance because of the location of the engines against the fuselage just 3 feet off the centerline.
4—There is no wind-milling propeller to increase yaw drag. Thus, the third fin has been eliminated, and performance is improved.

The "Anser" will be completely air conditioned with full pressurization to keep the cabin well below 10,000 feet at all times.

The wing deicing system will be electrical with a full cycling operation.

Instrumentation will be the basic "T" design with all of the latest flight instruments.

The radio gear will be UHF, VHF, and HF.

There will be an RCA radar unit for storm avoidance. The unit will weigh 75 pounds and be in the nose cone as an integral part of the aircraft design.

The five inch radar scope will be placed in the center of the instrument panel and the antennae can be tipped 10 degrees for ground mapping.

There will be the latest autopilot, probably with transistor tubes, as well as an altitude control.

There will be a "Flight Desk" which will slip into the side of the cockpit. It will do away with a cluttered cockpit where maps and papers are strewn all over.

An added feature will be a 16 hp electrically controlled, remote starting motor for water taxiing. It will fold into a door in the tail cone, completely fared and unseen.

When on the water a pneumatic cylinder will extend the motor. It will be started by pushing a button on the instrument panel. Along the side of the cockpit will be a steering wheel. There will be a forward and a reverse gear making the "Anser" seaworthy, navigable and not a nuisance to other watercraft.

Because Berns and his clear-thinking men have gone up every avenue of design, the "Anser" will wear a high activity, fluorescent type paint job which can be seen from a distance of 2 or 2.6 times that of normal paints.

Just recently Berns left Lockheed to devote his full time to the "Anser."

Following close behind were three others. Jim Holley, a veteran plane sales manager, and the Hodgson brothers, Charlie and John, also ex-Lockheeders who now wield 4H pencils and coping saws, whichever is needed.

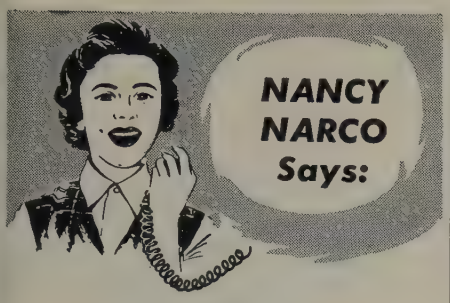
The target price of the "Anser" is $125,000 bare.

There will be an unusual sale option clause. ACME will guarantee the cost not to exceed $200,000 per copy and, if the number of aircraft produced reach what is hoped, there will be a refund. If the production goes even higher, the first buyers will continue to get a kickback.

Certainly the "Anser" is an ambitious

(*Continued on page 74*)

SAC
Silver Jubilee Newsreel
BY JACK PATTON
STILL UP FRONT
SPELL JET WITH A G OR J ?
SAC IN LATE '54 BID ON THE AF's FIRST JET ENGINE O'HAUL CONTRACT.
THE WINNAH ..... SOUTHWEST AIRMOTIVE!
WRIGHT FIELD
WE SUCCEEDED IN ONE OF THE BIGGEST STEPS IN PRIVATE AVIATION HISTORY.
WE DID IT!
I'M SLEEPY
AFTER BUT 150 DAYS OF 'ROUND-THE-CLOCK LABOR SACSTERS TESTED ENGINE #1
YOU BOYS'VE NEVER LET US DOWN!
THE JET AGE AT SOUTHWEST NOW IS A BIG AND EFFICIENT REALITY.
FIRST IN THE JET AGE!
Since 1955, America's first and only commercial, non-manufacturing jet engine overhaul facility.
Opening this year, America's first jet-age business flying terminal
1932 A QUARTER CENTURY OF LEADERSHIP 1957
Southwest Airmotive Co.
LOVE FIELD DALLAS
DIVISIONS: KANSAS CITY, KANSAS DENVER, COLORADO



One of the nicest things about Omni, compared with the old LF four-course ranges, is the fact that Omni radials pretty much stay put. No wildly bending beams near water, mountains or at sunset, and no multiple signals.

Because Omni provides so much more accurate navigational guidance, it has been possible to designate airways closer together.

This, in turn, has wisely necessitated a requirement that airborne VOR receivers be periodically checked if used for IFR operations. CAA regulations call for an accuracy check both every 10 hours of use of the VOR equipment and every 10 days. These checks are not only a requirement for IFR operations but good practice for anyone who navigates basically by VOR.

There is a choice of four simple check procedures which may be followed:

1. RADIATED TEST SIGNALS. At certain major terminals radiated test signals are operated continuously (LaGuardia on 108.6 mc; Kansas City on 113.0, for instance). With the deviation needle centered and the "to-from" needle reading "from," the Omni-bearing selector should read 0°. With a "to" reading and needle centered, the bearing should be 180°. Plus or minus 4° allowed.

2. GROUND CHECK. At airports close enough to VOR stations, certain ground check points are designated by signs adjacent to taxi-ways with the correct radial shown. Plus or minus 4° allowed.

3. AIRBORNE CHECKS. CAA Certified Airborne Check Points have been established near many airports over prominent landmarks with the correct Omni-bearing indicated in the Flight Information Manual.

In the absence of a certified check point, select a VOR radial lying along the centerline of an established Victor airway, choose a prominent ground check point preferably 20 miles away and fly over it at reasonably low altitude. Accuracy for airborne checks should be within plus or minus 6°.

4. DUAL OMNI. If you have dual Omni, tune both units to the same station. If the bearings are within 4 degrees of each other you're OK.

Can't help but add that with the Narco Omnigator Mk II or the Narco VOA-3 Omni Converter, you should be well within limits every time. These units leave the factory with a certified accuracy of better than plus or minus 2° and have carefully engineered circuitry to provide stability for prolonged bearing accuracy.

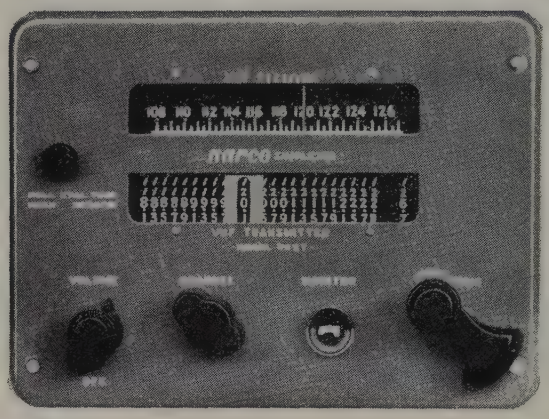
Nancy

NARCO • Fort Washington, Pa.

P.S. If you haven't seen the new Narco "How to Fly Omni" booklet, just write me for your FREE copy.

Need more frequencies?

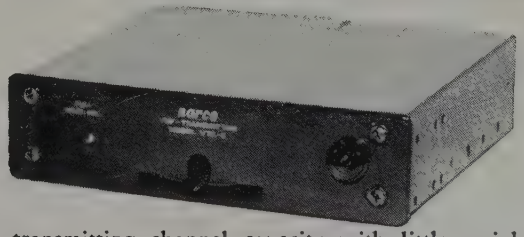
. . . FOR BETTER TOWER, EN ROUTE AND DIRECT CENTER COMMUNICATIONS



Add the narco SIMPLEXER 27 CHANNEL VHF TRANSCEIVER

The Narco 27-channel Simplexer is business aviation's most popular communications transceiver. With its broad-band transmitter (118 to 126.7 mc) the Simplexer accommodates 27 crystals covering every channel needed for normal IFR operations. "Whistle-stop" feature gives quick, crystal-calibrated tuning for simplex transmission with center, tower or ATCS. Compact size permits convenient installation. Thousands of Simplexers are in daily use. Just the answer for that extra communications unit you need while working VOR or ILS.

AND NOW! *narco* VTA-3 27 CHANNEL TRANSMITTER WITH "WHISTLE-STOP" TUNING FEATURE



Now, multiply transmitting channel capacity with little weight penalty and lowest cost with the new Narco VTA-3, 27-channel VHF transmitter. VTA-3 can be used with own power supply as independent unit or in conjunction with Narco Omnigator or Simplexer. Available in low-band version (118 to 123 mc) or high-band version (121.5 to 126.7 mc).

"Whistle-stop" feature provides positive, crystal-calibrated tuning of any VHF receiver in the airplane.

You'll enjoy the convenience of the extra 27 channels provided by either the Simplexer or VTA-3. Bring your communications up to date with one or both of these fine Narco units. See your Narco dealer or write for brochure.

narco

NATIONAL AERONAUTICAL CORP., FORT WASHINGTON, PENNSYLVANIA

Helicopter Facilitates Modern Surveying

Recently, Southwest Helicopters Inc., Van Nuys Airport, Calif., conducted an extensive aerial survey for the Pacific Lighting Gas Supply Co. over the proposed route of the planned 34 inch gas line from Newhall to Paloma, Calif. The project, as presently contemplated, indicates heavy construction for a distance of eighty miles north of Newhall through the rugged San Gabriel Mountains.

A Bell Helicopter was used to transport Frank Whipple, field engineer, Gene Allen, welding foreman, M. H. Buckland, construction superintendent, and Martine Deceta, pipeline repairman, over the area selecting the most desirable route considering utility, construction and maintenance. At the same time, preliminary line stakes were set and markers located to guide the first ground crews on the job.

The initial phase of this project was completed extremely rapidly, at a saving of many man hours, in addition to precluding the need for a large and cumbersome organization of supply and supervision. Numerous inaccessible locations were brought within easy working range because of the unique capabilities of the helicopter.

This type of operation was not new to us, this being only one instance from an outstanding record of service with oil, gas and construction companies throughout the world. However, it does illustrate the benefits derived from the modern methods employed by the most progressive firms in business and construction.

Of interest in connection with the current upsurge in commercial and industrial construction is the fact that Southwest Helicopters has been consulted by a great number of large and small contractors for information and advice concerning the advantages to be realized through the application of the helicopter to all types of conventional and unusual transportation, supply, maintenance and construction problems.

It appears, definitely, that the days of the old time construction "gang" with its complicated and inefficient organization are fading rapidly into the past.

New Machine Upholsters Panels in One Operation

A new machine designed for fabricating panels for the aircraft, automotive, furniture and luggage industries is being produced by Kamborian Products, Inc., Cambridge, Mass. The Kamborian Edge Folder stretches material over one surface of a form, and, using thermoplastic cement which is fed automatically under controlled temperature to the operating head, cements the marginal portion to the reverse side securely in one operation. Knurled feed gears and automatic folding and cementing controls result in fast operation, uniform high quality, savings in material, and do away with messy precementing operations, it is claimed.

Caution on Moffett Jet Traffic

It is recommended that all aircraft coming in from the South, to land at San Francisco airport, should fly VFR and pass West of Moffett Field, and to cross Moffett not below 2500' VFR.

When VFR and using V-107 in Oakland, cross Mission not more than 3 mi. West of conterline of airway; cross Fremont on course or to the East.

New Arizona Air Directory

The Arizona Aviation Authority is completing its Arizona Airport Directory.

It will include a full color map of the state, showing all airports.

Any wishing this directory can request it from Arizona Aviation Authority, 2717 E. Airlane Way, Phoenix, Ariz.

By Russ Brinkley, Pres.

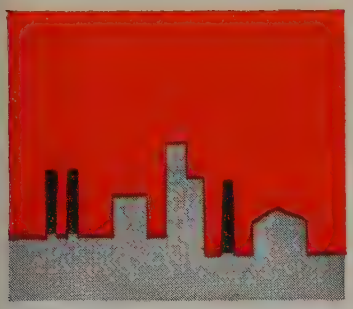
One of the most demanding assignments allotted to various OX5 Club committee chairmen is the annual chore of Ralph H. McClarren, who heads the national awards committee. It is Ralph's job to select the outstanding club member of the year to be named Mr. OX5. Since the OX5 Club is made up of approximately 4,000 active people many of whose accomplishments are ever making news and gaining wide recognition, great research, technique and diplomacy is required in the selection of a Mr. OX5 who will meet with the approval of the majority of members of the aviation fraternity.

This year, Ralph and his committee, after extensive deliberation, prescribed the award to the former Major General Edward P. (Ted) Curtis, Vice President of the Eastman Kodak Company and recently a special assistant to President Eisenhower for air facilities planning. That this was a wise selection has been borne out by the fact that numerous other awards of national renown are now being heaped upon Mr. Curtis for his activities.

As for the genial Mr. Curtis, he is an active charter member of State Wing Number One at Washington, D.C. The widespread support he has received from the various phases of the aviation industry may be classified as something just short of a miracle. It is a rare occasion when anyone in this industry comes up with something that meets with such a wide approval. No wonder then that so many other individuals and organizations along with the OX5 Club, have placed their stamps of approval on Mr. Curtis.

California To Regain Two Restricted Areas

Two restricted areas were released by the Navy and were restored to California's usable airspace. The first is located 5 miles northeast of El Toro and the second 10 miles north of Miramar NAS.



EASTERN SEABOARD OR TEXAS GRASSLANDS *Esso is there . . . at 600 airports from Maine to Texas!* How convenient business and pleasure flying has become! Now, when you plan a trip, the least of your worries is having the plane properly serviced – thanks to the special effort Esso Aviation Dealers are making to save you time and trouble. Your Esso Aviation Credit Card, for instance, allows you to charge not only gasoline, oil and lubrication, but tire and battery service, landing fees, overnight in-transit storage and most minor emergency repairs as well. Enjoy your next trip . . . land where there is an Esso Aviation Dealer.

FREE TO PILOTS! See your nearby Esso Aviation Dealer for your free copy of "The Esso Co-Pilot"—a complete directory of Esso Aviation Dealers.

Anser-Corporate Flying

(*Continued from page 70*)

attempt to solve all of the corporate market's problems in one airplane at a chewable price.

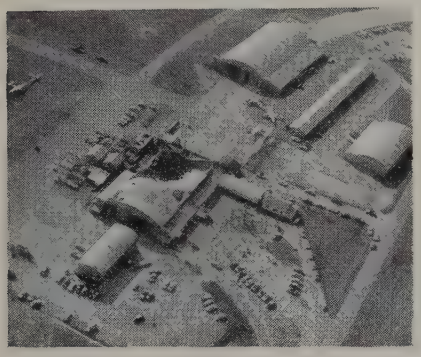
If ingenuity can cut the mustard the "Anser" will be a gold mine in the sky.

No Slow Down In Aero Design's Production

In spite of a damaging fire at Aero Design & Engineering Co., Bethany, Okla., there is no slow down in production facilities.

R. T. Amis, Jr., president of the company said there will be no interruption in the operations of the company or in the supply of parts to Aero Commander customers for the maintenance of their airplanes.

The company had fifty new airplanes



in its pipeline and modification facilities which were undamaged and which will be delivered to distributors.

Amis said that production activities will be established immediately in the company's new facility at Tulakes Airport, which is now in the last stages of completion. The new plant is approximately three times the size of the facility which burned August 25.

Already two departments of the company, the engineering department and the purchasing department, have moved into the new quarters.

The production facility destroyed by fire was only one of five main facilities of the Aero Design & Engineering Co. The others include a Modification Center at Cimarron Field, Oklahoma City, the Engineering and Research Division, Norman, the machine shop and tooling facility at Bethany, and the finishing facility at Downtown Airpark, Oklahoma City. In addition, the company has several storage and supply warehouses adjoining the plant at Tulakes Airport which were undamaged.

Tahoe Airport Study Underway

The State of California has begun an initial study for an airport to serve the Lake Tahoe area. This study will make Tahoe eligible to receive a Federal Aid Grant of $78,005 for fiscal 1958.

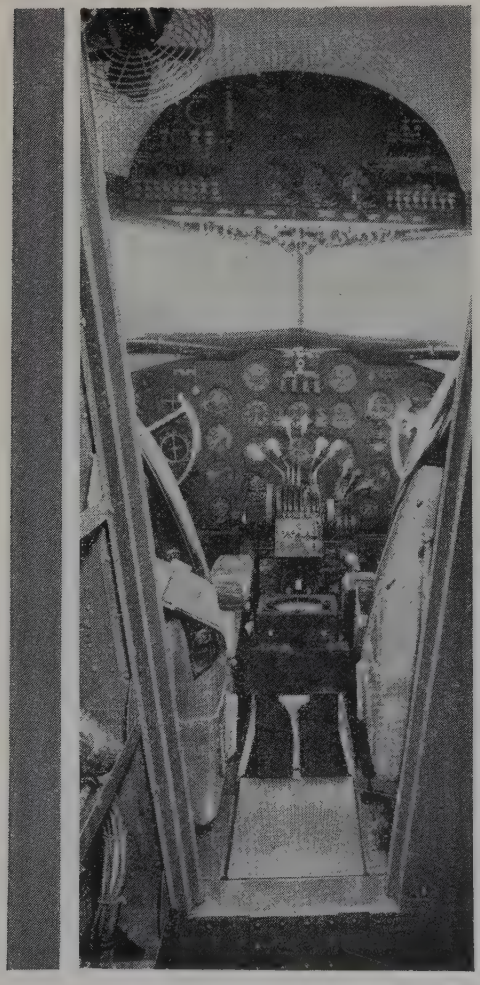
Pac-Aero Producing Napier Spraymat

The "Napier Spraymat" thermo-electric system of de-icing will be manufactured by Pac-Aero at Santa Monica, it was announced.

"Spraymat" consists of flame-sprayed metal elements sandwiched between layers of insulating material, the base insulation acting as an adhesive to secure the heater to the component to which it is applied.

The process is being used successfully on the Brittania and the F-27.

VERNON B. BENFER, *President, PacAero Engineering Corporation. In addition to producing the Learstar, PacAero offers a complete overhaul, modification service.*

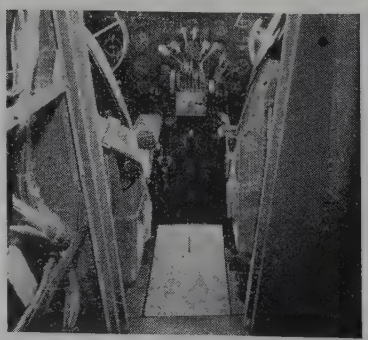


TUCK-AWAY Bendix RADAR FOR LODESTAR

engineered and installed by Executive Aircraft Electronics, Inc.

This unique installation of a Bendix X-Band Weather Radar System for a Lockheed Lodestar was designed, engineered and installed by the technicians of Executive Aircraft Electronics for a satisfied customer. It folds away into the floor when not in use, permitting complete freedom for the pilots and easy entrance and exit from the cockpit. The installation represents an unusual and very satisfactory solution to a problem for all owners of Lodestars — the problem of proper use of space available.

The Bendix X-Band Weather Radar System was chosen because the Bendix name stands for top quality equipment and top performance in all communications, weather radar and navigation systems. Whatever your needs are in the field of electronics, call on the craftsmen of Executive Aircraft. We take pride in saying that satisfied customers are our best recommendation. Why not find out for yourself?



View of Lodestar cockpit with Bendix X-Band Weather Radar up and in position for use and folded away in floor well of cockpit between the two pilot seats. Note also the Bendix radio equipment and the treatment accorded the overhead radio and electrical control panel.

Call, wire or write today

EXECUTIVE AIRCRAFT *Electronics*, Inc.

P.O. Box 7307 • Dallas, Texas • Garland Airport • DAvis 1-2675

There's new ease of travel for you on United—world's largest user of airliner radar

Several years ago United Air Lines foresaw the need of radar on commercial airliners, and worked with Radio Corporation of America in the development and testing of airborne radar equipment.

Today—by virtue of this pioneering and a $5,000,000 investment in radar equipment and installation—United has more airborne radar in use than any other airline in the world. Most Mainliners are now equipped, and soon installation will be complete throughout the entire Mainliner® fleet.

For you as an air traveler, this is an important new benefit. Our pilots who operate United's radar-equipped aircraft are very enthusiastic about the results. They tell me that radar represents the greatest single advance in comfort and schedule dependability in the history of United Air Lines and the airline industry.

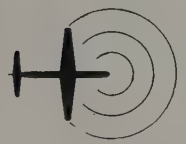
With radar in the cockpit, each Mainliner pilot now gets a clear picture of the weather up to 150 miles ahead, even through clouds or darkness.

Today, with radar, we fly through the smoothest corridors of the weather pattern, with more assurance of on-schedule performance and greater comfort.

Radar represents one of the many ways in which United Air Lines is continually making its service more comfortable, more dependable and more attractive to the increasing millions of travelers who are turning to air as the modern, easy way to travel.

W. A. Patterson

PRESIDENT
UNITED AIR LINES



WORLD'S LARGEST RADAR FLEET

UNITED AIR LINES ®

Navicom Cont.

(*Continued from page 51*)

Sperry's New Integrated Instrument System

A simplified integrated instrument system has been developed by the Sperry Gyroscope Co. Three panel instruments offer easy-to-read, essential flight information.

In addition to combining the functions of an array of conventional instruments, the system instantaneously computes the answers to complex flight problems previously requiring attention diverting calculations by the pilot.

Without increasing the "basic six" flight instruments, the Integrated Instrument System—weighing less than 30 pounds—pictures for the pilot his attitude with relation to the natural horizon, his position in reference to ground radio facilities, and tells him "how to fly" in order to make good his intended course.

The three indicators—HZ-1 Horizon Flight Director, C-6 Gyrosyn (R) Compass Indicator and R-1 Pictorial Deviation Indicator—actually replace the previously required Gyro Horizon, IIS Deviation Indicator, Directional Gyro, RMI and Omni Bearing Selector.

A lightweight, rack-mounted Z-4 computer computes the information to keep the aircraft on course or, during instrument letdowns, guides the aircraft to perfect runway approaches even under strong cross-wind conditions.

The three panel instruments of Sperry's integrated system are as follows:

HZ-1 Horizon Flight Director—Combining the functions of the Zero Reader and gyro horizon, the HZ-1 tells the pilot how to move the controls to follow a desired flight path and, simultaneously, gives him an accurate picture of pitch and roll attitude.

The retractable Flight Director bars, superimposed over the attitude presentation, provide simple, direct attitude control. By keeping the bars centered over the simulated airplane, the pilot can fly a preset flight plan with absolute precision. The two-tone pictorial horizon has full freedom in both pitch and roll to provide correct, conventional sensing regardless of aircraft attitude.

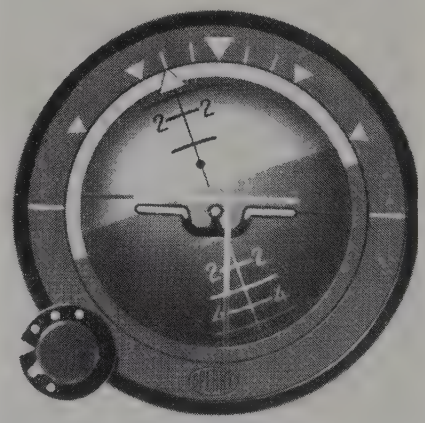
The design is such that the pilot has clear, qualitative aircraft attitude information (the pictorial horizon) at a glance and more refined pitch and roll command information (Flight Director bars) for precise maneuvering. Warning flag (not visible in picture) appears whenever the instrument is inoperative.

C-6 Gyrosyn Compass Indicator—Incorporating important improvements in the presentation of direction information, the instrument combines the functions of a master compass indicator, radio magnetic indicator and heading selector. It serves as the pilot's master display of all heading data. Improved radio cross-bearing information is given on the master dial.

Receiving its signal directly from the system's direction sensing element, the C-6 is free from repeater errors. A set-table course marker on the dial improves the presentation for the pilot and serves as the heading selector for the Flight Director.

MODEL R-1
PICTORIAL DEVIATION INDICATOR
ON ILS

MODEL C-6
GYROSYN* COMPASS INDICATOR



MODEL HZ-1
HORIZON FLIGHT DIRECTOR

R-1 Pictorial Deviation Indicator—Representing an entirely new approach to radio navigation, this instrument pictures the aircraft's position in relation to ground radio facilities.

The "V" represents the radio beam and moves freely about the face of the instrument. Position changes relative to VOR and Localizer beams are displayed clearly and precisely by the movement of the "V" in relation to the fixed miniature airplane. Displacement is read by the position of the miniature airplane in reference to the four "dots" on the face of the instrument. The "V" indicator also gives to-from information, swinging 180° as the aircraft passes over the radio station.

Glide slope information is given by the position of the horizontal bar in relation to the miniature airplane. Glide slope displacement is read against a fixed scale on the left of the instrument face. In VOR operation, where no glide slope information is available, the horizontal bar automatically swings out of view.

Other markings give heading information and valuable assistance in making procedure turns.

An automatic three-position warning and mode flag (LOC-OFF-VOR) and a separate glide slope warning flag tell the pilot at a glance which type of information he is receiving or warn him if the instrument is receiving inadequate radio signals.

CAA Policy On Runway Clear Zones

A final policy on runway clear zones in connection with the Federal Air Airport Program has been published by the CAA, U.S. Department of Commerce.

The policy establishes requirements which communities are expected to meet in removing or preventing obstructions in the areas beyond the ends of runways. It permits communities either to purchase the necessary land or obtain easements which will prevent erection of structures hazardous to aircraft landing or taking off from the runways. The final policy draft followed numerous conferences with interested segments of the aviation industry.

SF Airport Expansion Assured

San Francisco Airport has received an increase in federal funds from $766,246 to $1,250,000 in 1958.

The increase will enable the airport to extend runway 28-L by 750 feet, making it possible to handle the largest commercial jet airliners.

Oct. 2-4: NATIONAL AIRPORTS CONFERENCE, U. of Okla., Norman. Sponsored by the Amer. Assn of Airport Executives, U. of Okla., and through the cooperation of the CAA. Contact Joe Coulter, Max Westeimer Field, U. of Okla., Norman, Okla.

Oct. 16-18: NATIONAL ASSOCIATION OF STATE AVIATION OFFICIALS, annual meeting, Sun Valley, Idaho.

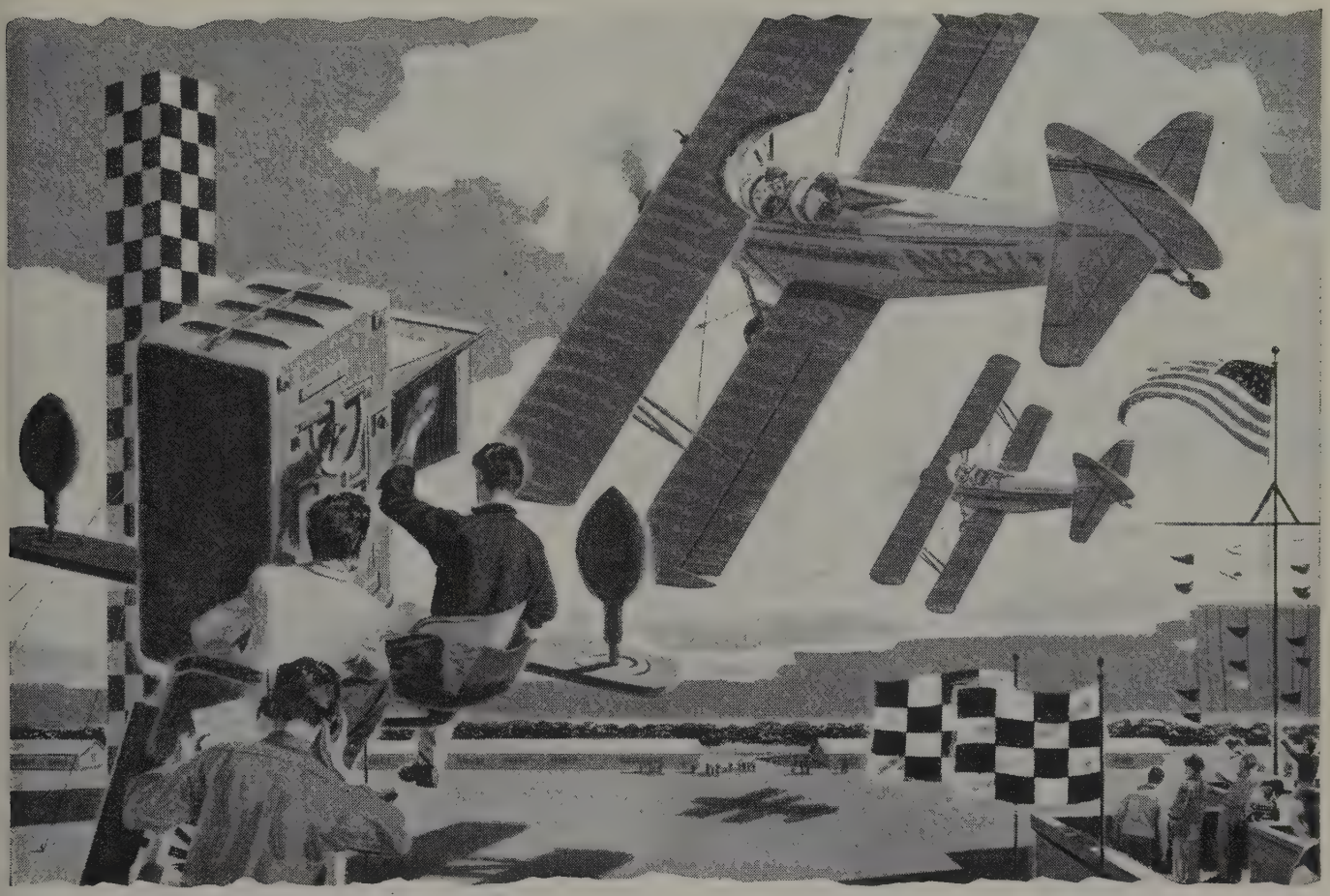
Oct. 24-25: FOURTEENTH ANNUAL DISPLAY OF AVIATION ELECTRICAL EQUIPMENT, Aircraft Electrical Society, Pan-Pacific Auditorium, Los Angeles.

Nov. 6-8: THIRD ANNUAL SYMPOSIUM on aeronautical communications, Hotel Utica, Utica, N. Y.

Nov. 13-15: NATA 18TH ANNUAL CONVENTION, Hotel Adolphus, Dallas, Texas.

PLANE FAX

by STANDARD OIL COMPANY OF CALIFORNIA



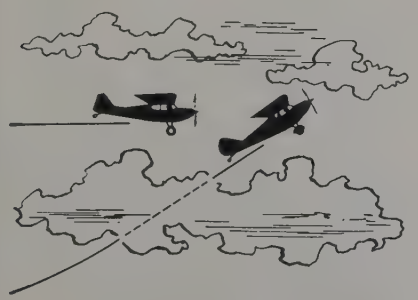
Realism in the movies with daredevil flying

When a movie script calls for pilots and planes to re-enact daredevil flying of the early 1930's, the producers often call on Joe Pfeifer. Hazardous flying of outdated aircraft is bread-and-butter work for him. Operating out of the Santa Susana Airport, in California, he and his fleet of 1930 vintage airplanes have appeared in many motion pictures based on early-time flying adventures.

"Hollywood makes two strong demands when shooting a flight scene," reports Mr. Pfeifer. "One is full power for realism and the other is minimum maintenance problems to eliminate production holdups. I get both with Standard aviation products. Chevron Aviation Gasoline burns clean, never fouls the plugs and gives me the extra power I need for movie stunt flying.

"RPM Aviation Oil keeps the aircraft in top condition and holds engine wear to a minimum. Rings and valves stay clean as new. I've had no engine trouble using RPM . . . and in my kind of flying that's saying a lot."

Mr. Pfeifer's fleet of 27-year old planes, the largest such group of aircraft still flying, includes a restored and modified Pfeifer fleet biplane, Phillips Skylark, Davis DWL and a Fairchild 22.



TIP OF THE MONTH

Avoid flying immediately below or above a cloud formation. Neither is a good place to be should another airplane suddenly pop out of the overcast.

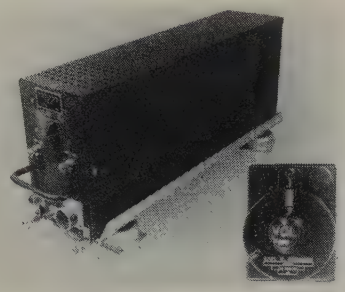
We take better care of your plane

CHEVRON AVIATION GASOLINE

AVIATION OILS RPM

T. M.'S "RPM," "CHEVRON," "PLANE FAX," REG. U. S. PAT. OFF.

$1785.00



180 CHANNEL
VHF TRANSCEIVER
118.0 To 135.9 MC

- All Accessories, Crystals, Antenna and Connectors furnished wired and assembled ready to install.
- Installed weight only 23 lbs.
- Transmitter power an honest 5 watts radio output.
- Size is standard ½ ATR.
- Control Head is Airline concentric type.

SPRINGER AIRCRAFT RADIO CORP.
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NORTHWESTERN AERONAUTICAL COMPANY

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CAA Approved Station
#2760 Limited
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Distr. for P & W Engine Parts
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Distr. for Winslow Filters

Approved facilities for Overhaul & Maintenance of Radio, Airframe, Engine & Engine Accessories

CAPITOL 4-5403

Safety Exchange

(*Continued from page 30*)

rear bearing; the front bearing was intact.

Master rod bearings sometimes develop hard spots on their lead indium coatings if stored for long periods, which become foci of failure. There was no record of the length of time the bearings had been in stock prior to installation in March 1954. The failed bearing had been reconditioned by its manufacturer. However, the extent of the damage precluded analysis of the quality of the reconditioning process which requires high precision and closely controlled processes.

Master rod bearings must be fitted to extremely close tolerances. Engine overhaul records indicated that engine assembly was performed in accord with manufacturer's procedures. Since this engine had 791 hours of operation at the time of the accident, it is unlikely that the bearing was fitted incorrectly because if it had been it would almost certainly have failed much earlier.

Probable Cause

The Board determines that the probable cause of this accident was loss of flying speed during single-engine flight for reasons undetermined, resulting in a spin to the ground.

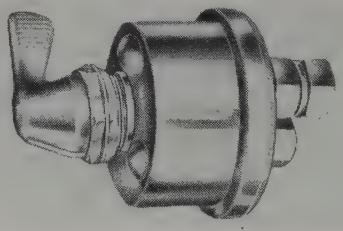
Operator

Phillips Petroleum Company is a Delaware corporation with headquarters at Bartlesville, Oklahoma. The company owned the subject airplane, N 29366, as well as a fleet of nine other aircraft of various makes, all used in the furtherance of company business. Phillips has owned and operated a total of 50 executive-type aircraft since 1927.

Although many pertinent maintenance records were lost in the fire following the crash, it appears that all maintenance on the aircraft and its power-plants was adequate and current.

Master Disconnect Switches Promote Safety

A double pole, single throw Master Disconnect Switch, ideal for private and commercial aircraft in both 12 and 28-volt systems, is available from Cole-Hersee Co., Boston 27, Mass. The



switch simultaneously cuts off the generator field circuit along with the battery switch, preventing voltage build-up from windmilling or runaway prop.

VFR on Top—2000 on Top

Most pilots on the West Coast make it an operating practice never to operate only 1000 on top if so cleared. Instead, policy is to maintain at least 2000 on top, consistent with the heading of the aircraft.

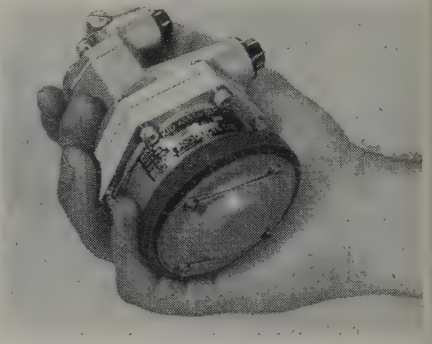
New Anti-Skid Device By Bendix

A new, non-electric anti-skid device to prevent aircraft wheels from locking and sliding when the brakes are applied, is announced by the Bendix Products Division of the Bendix Aviation Corporation at South Bend, Indiana.

This feature is also said to permit landing with the brakes applied. One anti-skid unit is installed at each braked wheel. It operates independently, cycling only when the wheel which it controls radically decelerates in r.p.m. This provides the maximum retarding effort.

Advantages claimed for the new equipment are said to include the prevention of aircraft wheel skidding, reduction of airplane stopping distance and the elimination of uneven tire wear.

The main sensing portion of the new anti-skid equipment is a rotating flywheel complete with governing fly bars which rotate within a small light weight housing. This flywheel is driven by a friction drive which makes contact with the rim of the airplane wheel or it can be located in the axle to be driven directly through an attachment to the hub cap.



THE BENDIX ANTI-SKID *device weighs 3.4 pounds. It can be adapted to large or small aircraft without design modifications.*

Outer Space Sounds May Be Weather Clue

Palo Alto, California: A Stanford University scientist, Dr. Robert A. Helliwell, told of plans for a worldwide study of whistling sounds and birdlike warblings which he said occur at altitudes up to 30,000 miles above the earth. Halliwell said the whistling sounds are produced by lightning discharges. The birdlike sounds, he said, sometimes come from great heights at dawn and are known as the "dawn chorus."

He said the sounds are propagated in the exosphere—an enormous region of nearly empty space beyond the regular layers of the ionosphere. The exosphere, he added, is a vital link between events occurring on the sun and subsequent effects in the earth's atmosphere because it is here that streams of hot gases from the sun, generated during periods of sunspot activity, are deflected by the earth's magnetic field.

Two Allison 501-D-21 turboprop engines of 3750 HP with Aeroproducts reversible propellers

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First aircraft manufacturer to apply for a CAA-type certificate for an executive transport airplane (CAA-4b, April 23, 1957), On Mark will test-fly its new MARKSMAN 450 in early summer of 1958. First deliveries are scheduled for summer of 1959. The MARKSMAN was not designed for the Military, therefore corporation orders will be filled in the sequence in which they are received. Several reservations for first deliveries of The MARKSMAN have been made, so it is suggested that corporate owners and pilots obtain complete specifications and performance data as well as general cost figures before serious consideration is given to the purchase of *any* type of executive airplane. A brochure giving most of this information about The MARKSMAN will be sent upon request.

Please address all inquiries to Robert O. Denny, President.

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. . . . in the business hangar

■ **Howard Aero Service** has installed a completely new interior in Negley Bag & Paper Co.'s Lockheed Lodestar; also a 100-hr. check. Elton Rust is chief pilot. ☐ National Steel Co., Pittsburgh, has had complete standardization of cockpits of both the co.'s Lockheed Lodestars made to conform to cockpit in firm's Super Ventura; radio, electronics, and instruments were relocated. Bob Hamilton is chief pilot. ☐ **Texas Gulf Sulphur Co.'s** Lockheed Lodestar has had a double engine change, a 100 hr. inspection and installation of a Narco 1016 comm. system. Fred Ayers is chief pilot. ☐ **Chief Pilot Bob Donnell,** Houston, recently brought the Frank Waters Lodestar in for a tank deseal and reseal, wing overhaul, paint job, and double engine change. ☐ **Copano Oil Co.'s** Super Ventura is in for installation of R-2800-CB16-AM5 engines; also a 100 hr. inspection and relocation of plane's radio equipment. Hub Gayle is chief pilot.

■ **The Garrett Corp.'s AiResearch Avi Service Div.,** Los Angeles, Internat'l Airport, is doing extensive work on the Convair 340 owned by Union Carbide and Carbon of New York. Brought in by Capt. C. W. Maynard and Joe Pillar, craft is receiving an exterior stripping and repaint job, installation of two Collins 17L6 transmitters, Collins 51R and 51X receivers, AM-FM tuner for the cabin radio, Bendix C-band radar, compliance with all the latest Convair bulletins, and miscellaneous interior modification work. ☐ New 1830-94 engines are being installed on Pittsburgh Plate Glass's DC-3, along with the complete AiResearch Maximizer kit, the AiResearch-designed geared aileron boost tap, Sperry D2 airborne engine analyzer. Bendix C-band radar, two ARC type 21 lightweight ADF systems. Chief Pilot Buck Newton and Bob Middlebee accompanied the plane. ☐ The American Can DC-3, flown in by Chief Pilot Jim Hopkins and by Earl Dahl, is in line for the Maximizer, AiResearch lightweight aluminum oil coolers and Bendix X-band radar. ☐ A return to the AiResearch hangar has been made by Swiflite Aircraft Corp.'s Convair 440 to undergo a 500-hour inspection and completion of the latest Convair service bulletins. Capt. M. C. Barrett and George Pennington made the trip. ☐ The Ford Motor Co. Convair 240, with B. J. Bergesen, Mgr. of Transportation on hand, is in for exterior stripping and repainting. ☐ An Italian Air Force Convair 440 is slated for a complete custom designed interior and an auxiliary power unit.

■ **Southwest Airmotive** this month completed a 8,000 hour inspection, new interior and installation of safety performance kit on the J. A. Cattle Company Beechcraft, brought in by Pilot Monty Ritchie. ☐ Pilot Paul Wheeler brought the Fletcher Oil and Gas Lodestar in for periodic inspection. ☐ Shamrock Oil and Gas Chief Pilot Jimmy Boyd brought the company's Lockheed Lodestar to SAC for 100-hour inspection. The company's D18S Beech—brough in by Pilot Tom Smith—had 8,000 hour inspection, a complete new interior, installation of safety performance kit, and new paint job. ☐ Pilot Poddy Parish brought the Trinity Drilling Lodestar to Southwest Airmotive this month for minor repairs. ☐ Also in for minor repairs was Pillsbury Mills' E18S Beech.

■ **Horton & Horton** has completed installation of a compact black oak Formica galley with mixing bar, thermos service, hot cup, and drained ice chest in the Thompson & Green D-18 (Nashville, Tenn.). Space in former baggage compartment made useable by aft bulkhead removal and CAA certified circular beef-up. Eggshell headlining, turquoise nylon seats, red carpet, black oak featherweight laminate on fore and aft bulkheads. ☐ Pan American Petroleum (formerly Stanolind) flew another Douglas A-26 to Fort Worth for a total of four Horton & Horton interiors. ☐ Mrs. Kenneth Spencer flew in from Kansas City to select fabrics for their new Aero Commander 560E H & H interior; the third Spencer Chemical airplane H & H has styled. ☐ J. R. Turk, Tennessee Gas Transmission, Houston (NBAA), supervised the TGT Martin B-26 undergoing weight-saving; cleanable H & H interior treatment designed for the entire fleet. ☐ Mr. J. W. Eagleton brought the Shell Pipeline (NBAA) Dove back to H & H for cockpit seat "pilot ease" upholstery, baggage compartment utility upholstery. ☐ Bill Buchanan's Chicago "B-Line" Air Charter Service received the full interior treatment at Horton & Horton. This fifth interior for Mr. Buchanan includes compact galley, aft bulkhead removal and beef-up, a regular window replacing porthole, and Formica "Skytables". Turquoise and beige color scheme high-pointed with woven grass laminate on bulkheads.

■ **Pacific Airmotive Corp.'s** Burbank Aircraft Division has delivered The Murray Corp.'s newly-acquired Convair 240 to chief pilot E. C. Spencer after license and modification. Work included installation of the PAC-designed integral stairway—first to be installed in the aft side door of a 240, auxiliary ADI tanks system, auxiliary air compressor, D-2 Ranger auxiliary power unit, and rotating beacon. Sperry autopilot was installed in conjunction with Qualitron, Inc. ☐ Gulf Oil's new Convair 440 is in service after delivery direct from the factory to PAC-Burbank for installation of the PAC expanded fuel system to increase capacity to approximately 2,080 gals. and 40 gal. auxiliary oil tank. Further modifications included carburetors, spark advance solenoids and wiring in both engines, installation of APU, oxygen system, auxiliary air compressor, water heater, Hardman sunvisor and rotating beacons mounted in pressurized boxes. Aero Interiors and PAC installed custom interior. ☐ Chief pilot W. T. Brownell accepted Daniel Peterkin, Jr.'s, PV-1 following relicense, removal of belly fuel tanks and installation of PAC-engineered baggage compartments, including foil-type soundproofing, 3-bottle JATO installation, removal of wings and installation of Aircraft Tank Service-modified outer panels with integral tanks, as well as center section tanks. Other work included engine change to Super B engines, with DC-6 jet exhaust stacks, installation of high pressure de-icer system, enlarged

alcohol tank, emergency fuel supply system, Learstar radome kit, Sierracin heated windshield, cabin instruments, overhaul of landing gear and hydraulic systems, rework of bat wings, removal of nose fuel cells, modification of heater system to incorporate Barber-Colman automatic controls, modification of ground blower unit, X-ray of gear and wing attach structure, accomplishment of service bulletins, plus strip and paint. ☐ General Motors' PV-1 delivered to Charles Chadwick and Laddie Prochazka after major work including JATO, integral fuel tanks, removal of bomb bay section fuel tanks and installation of PAC-engineered baggage compartment, cross-feed fuel system and high-pressure de-icer boot system. ☐ Richfield Oil's chief mechanic, Howard Flora, accepted delivery of their Bakersfield-based Twin Beech after 100-hour inspection. ☐ Boquillas Co.'s DC-3 101KC flown in by chief pilot Jim Gray for minor maintenance. ☐ Union Oil's 340 is back in service after 50-hour engine inspection and routine maintenance. Pilot is Chuck Wheeler. Union's chief pilot is Jim Stevenson. ☐ AiResearch is doing considerable work on the DC-3 owned by Colo. Interstate Gas Co. pilots Dick Shroads and Criswell brought in the craft for installation of Bendix X-band radar, new inverters, auto-pilot, Omni, 200 amp. generators, wing removal and inspection, new fuel tanks and Winslow oil filters. ☐ A number of other DC-3's have been undergoing work at AiResearch. One from Axelson Manufacturing Company, with Pilot Angelo Pappas, is getting a 100-hour inspection and radar modification. The first of the CAA's DC-3's came in for Maximizer installation, and Garrett Corp.'s own plane received a Janitrol heater. ☐ Two Super Beeches came into the AiResearch hangar from extreme range of distances. Pilots Bill Dodd and H. Werkle flew the Food Fair Stores' Super all the way from Miami, Fla., to be equipped with lightweight AVQ 50 radar. The Super from McCulloch Motors, whose plant is just opposite L.A. Airport, came in for a double engine change, 100-hour inspection and exterior painting. Pilot Jim Dyerly was on hand. ☐ The Martin Company's 440 was received off the Convair line for an executive interior, additional wing tanks, exterior painting, an auxiliary power unit and miscellaneous radio work. ☐ American Can's 440 (Pilot Jim Hopkins) is in for Convair bulletin modifications. ☐ Earl Hartman took back Goodyear's D-18 after a 100-hour inspection.

■ Third Beechcraft Super 18 executive transport of five purchased by the Brazilian Ministry of Aeronautics left Beech recently for Rio de Janeiro where it will be placed at the service of President Juscelino Kubitscheck de Oliviera. First two Super's are already in service in Brazil, transporting high civilian and military officers assigned to the South American nation's capital. The five 8-place, twin engine 18's represent over a half million dollars in export sales.

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G-12/L2

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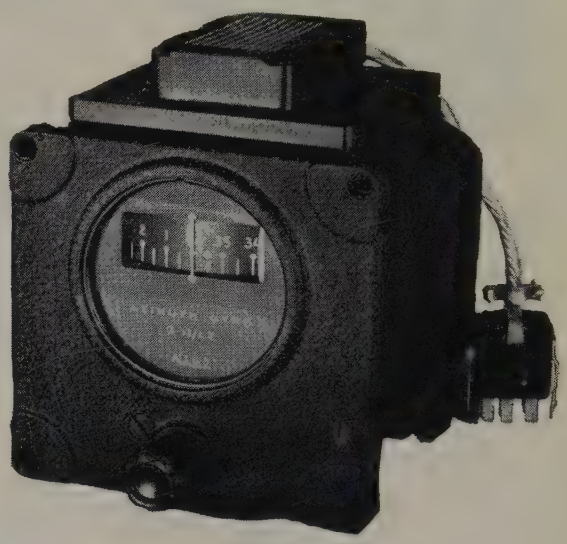
G-12 and L-2



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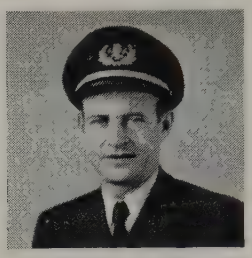

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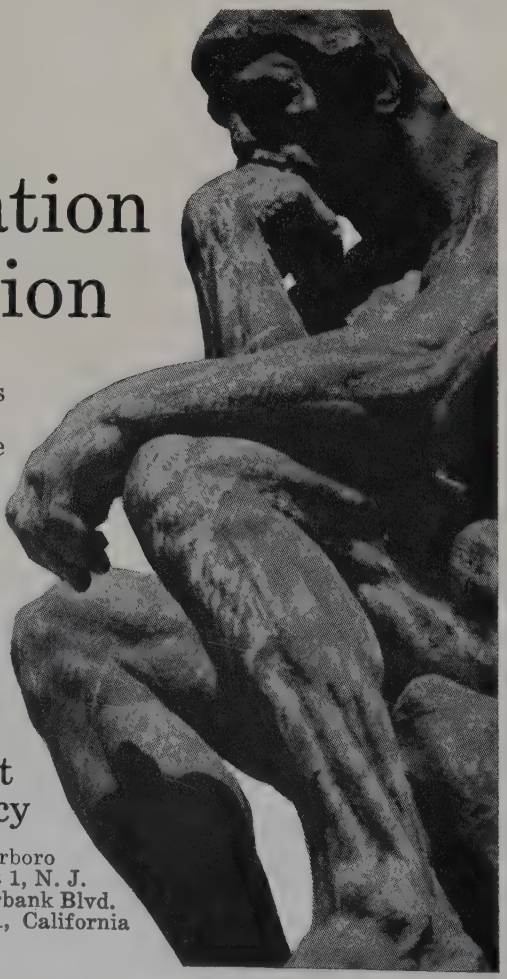

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■ **Van's Air Service, Inc.,** Winona, Minn., ran 100-hour inspections of NBAA members J. R. Watkins Co.'s DC-3 and Cessna 310. ☐ Ray O Vac Co. Aero Commander. ☐ Gisholt Machine Tool Co. Beech E-18S. ☐ Giddings Lewis Machine Tool Co. Lodestar. ☐ Annuals were run on Navions of Berry, Sladek, & Yeggy, Iowa; McKee Motors Ltd., Toronto; Layne-Minnesota Co.; Tilton Motor Co., So. Dak. ☐ Austin & Schaub, Minn. ☐ Tri-Pacer of Dr. G. T. Hesley, Minn. ☐ Engines were majored on the Temco Riley of Joel Green Associates, Minn. and the Bonanza of George Green, Minn. ☐ Radio installation of glide slope receiver on Gisholt Machine Tool Co.'s Beech E18S, with radio work on all the above aircraft. ☐ Special radio work was done on the Bonanzas of Northern Plastics Co., Dairyland Power Co., and North Engraving & Mfg. Co., all of Wisconsin. ☐ Aero Commander of Marathon Co., Wisconsin. ☐ Bonanza of Cooke Lumber Co. Ltd., British Columbia.

■ **Aerodex, Inc.,** Miami Int. Airport, expects completion by July 26 of its half million dollar expansion program in which 44,000 sq. ft. of shop area is being added to its aircraft engine and accessory overhaul facility's present 222,000 sq. ft. Aerodex has the largest engine overhaul production in the world with contracts for parts modification and accessory overhaul with the U.S. military services and foreign govts. A separate operation serves business aircraft operators and several domestic and foreign airlines. Currently underway is a large Brazilian govt. contract, with Brazilian Air Force mechanics receiving OJT at the plant.

■ **Planeservice, Van Nuys Airport,** installed a new engine in the Bonanza owned by Herman "Fish" Salmon, Lockheed, chief test pilot. ☐ Jerry Fairbanks had a 100-hour relicense on his Twin Beech. ☐ Jack Holland flew in his new Apache for 100-hour check. ☐ Don Critchfield had Goodyear's Bonanza in for its 100-hour. ☐ Charles "Chuck" Nichols piloted Texaco's Cessna 310 for 100-hour and the installation of a rotating beacon. ☐ Stout Engineering brought in its Bonanza for 100-hour inspection. ☐ Warren Dickenson landed with his Navion for a new engine installation with Symons cooling. ☐ C. T. Dearborn had a 100-hour inspection on his Twin Beech. ☐ J. W. Martin of Aircraft Associates flew in his Cessna 182 for its 100-hour check.

■ QUALITRON, INC., Burbank, is installing a DARE communication and navigation system in a Cessna 310 owned by Wm. Valentine.

☐ Columbia-Geneva Steel's Lodestar flown by Jim Richter out of Oakland is now using a dual ARC ADF-21 system installed by Qualitron.

☐ Two new 1049H Constellations belonging to Resort Airlines in Oakland have recently undergone extensive radio modifications by Qualitron including installation of Aer-O-Com ATOM-STAR H.F. equipment. Qualitron is presently completing the sixth of a series of nine complete radio installations in C54 aircraft owned by Resort.

☐ Bud Miller, pilot for Producer's Cotton Oil Co. of Fresno, has had Qualitron install

an ARC ADF-21, ARC Course Director and DARE DTR-360 communications system in his company's D18 Beechcraft.

☐ Al Litzenberger, Chief Pilot for Mesta Machine Co.—Pittsburgh, has the A-26 at Qualitron in Burbank for installation of dual Collins 17L-6, VHF transmitters and routine radio maintenance.

☐ The Martin 404 flown by "Chuck" Hanner for National Supply Co., Pittsburgh, is having a Sperry Integrated Instrument system installed by Qualitron.

☐ Len Mills, pilot for The M. H. Whittier Co. D18 Beech is now using a DARE DTR-360 for communications which was installed by Qualitron.

☐ **J. Ray McDermott,** New Orleans, took delivery of their second green nylon custom Widgeon interior. ☐ Final custom touch for Cuban Govt's new "J" Executive Bell Helicopter was Cuban flag, hand-embroidered on white Peruvian linen seat headrest.

SOUTHWEST AIRMOTIVE CO., *Love Field, Dallas, opens new business flying terminal before end of year. Features restaurant, flight operations room, SAC offices.*

Contractors Use Company Planes To Cut Travel Cost

Contractors now form the largest single group of business plane users, reports the publication Construction Methods and Equipment.

Uses of the plane are varied. They carry mail to remote dam sites, haul needed spare parts and carry the right man to the right job at the right time.

The type of craft used varies from small, single-engine, two place planes, piloted by company presidents, to multi-engine aircraft piloted by professional crews.

The tax structure of the post-World War II period has made the acquisition and operation of corporate owned aircraft attractive. Many contractors can depreciate a plane for tax purposes at a 25 per cent annual rate, although the average life of a plane is considerably longer.

California's New Pearce Airport

The newly constructed New Pearce airport at Clearlake Highlands, California is now open for aircraft. The single runway, 2010 feet long, heads 125-305 degrees.

Univair and Flottorp Negotiate Sale

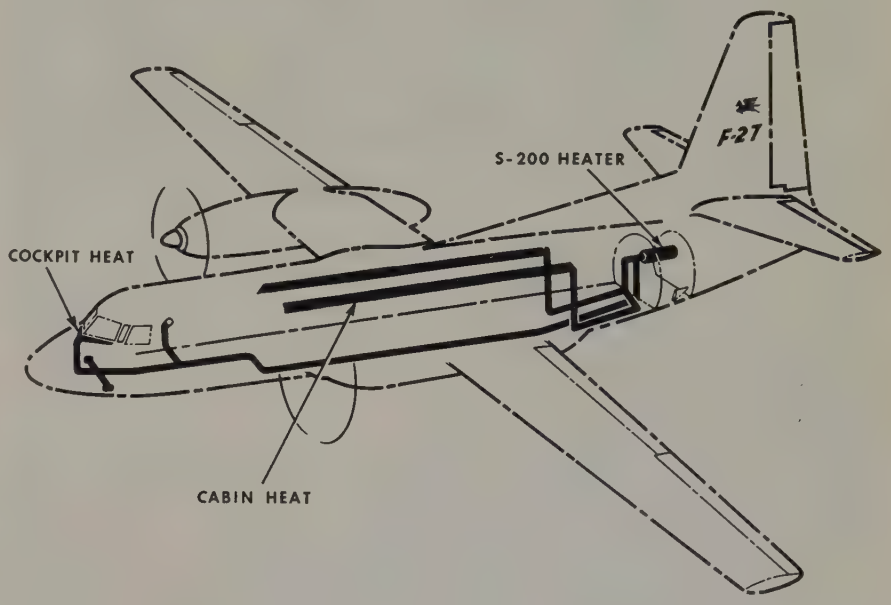
Univair, (Universal Aircraft Industries) Denver, Colo., will become one of the four leading manufacturers of propellers for light, single and multi-engine aircraft through its recent purchase of the wood products division of Flottorp Propeller Co.

The purchase, according to J. E. Dyer, president of Univair, includes CAA Type Certificates for the Flottorp Fixed Pitch "Armour" coated wood propellers, the Flottorp controllable models, the Bonanza Plastic covered blades, Test Clubs, etc., with all engineering, tooling, etc. Univair presently produces the Koppers Aeromatic and Univair Fixed Pitch props.

Thermal Airport Awarded Contract for Liaison Planes

Increased activity at the Thermal Airport was indicated this week with the announcement that the Erle L. Bacon Corp. operators of the airport, have been awarded an IRAN maintenance contract for L-19 A type aircraft. The L-19A is a liaison type plane.

The Bacon Corporation, in addition to operating the Thermal Airport, is engaged in the sales and servicing of Cessna Aircraft at Santa Monica Municipal Airport where they maintain complete overhaul and maintenance facilities, The corporations general offices are located at Santa Monica.



Janitrol—key to F-27 comfort

The new Fairchild F-27 propjet replacement for the DC-3, keeps passengers and crew comfortable in the coldest weather with a Janitrol heater. On the ground or in flight a standard Janitrol S-200 heater automatically keeps cabin and cockpit temperatures at a pre-selected temperature regardless of outside weather.

Located in the rear of the fuselage aft of the pressure bulkhead, the Janitrol S-200 occupies very little space. Fuel consumption is negligible.

If there is one reason why Janitrol aircraft heating equipment has achieved universal acceptance by leading airlines, corporations, and aircraft manufacturers, it is this: Janitrol heating equipment has become the *standard of expectation* in dependability, performance and economy.

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BEECHCRAFT TRAVEL AIR, *the company's first entry into the 4-place, twin-engine business aircraft field, has received CAA type and production certificates. Here, (second from L.) John P. Gaty, Beech v-p, gen. mgr., receives papers from Gomer Jones, Travel Air project engineer. Others are: Herb Rawdon, (L.) Beech mgr. comm. engineering, and Herman Barnett, (extreme R.) chief proj. eng. for comm. aircraft. Group is in front of first production model Travel Air; prototype model is in R. foreground. Beech will go immediately into production of the new 200 mph exec. plane, 4th addition to their commercial line.*

San Jose To Spend $6,048,000 To Expand Airport

The city-owned San Jose Municipal Airport is to be expanded to make it one of the finest airports in California.

The city has acquired 278 acres of land to permit development of the airport. The main runway will be increased from its present 4,500 feet to 6,000 feet with an instrument landing system.

Work is in the process now to remove all restrictions. The Guadalupe River and high voltage lines will be realigned to make room for facilities for executive aircraft of local industries, new aviation companies, and the administration building.

The airport is conveniently located just ten minutes from the heart of San Jose.

A new administration building will be constructed to handle aviation business as completely as a major airport.

The new tower is now in operation. It is air conditioned with a radar room for future installations. At the present time the CAA-operated tower guards:

Transmitting	*Receiving*
118.7	3023.5
121.9	118.7
348.6	121.9
121.5	348.6
257.8	121.5
243.0	257.8
278.0	122.5
	243.0

The rapidly accelerating use of the airport has compelled city officials to float a bond issue to get the airport ready for the jet age.

Planes based at field in 1954—63
Planes based at field in 1956—100
1957
Takeoffs and landings 1957 (est)—150,000

San Jose Municipal Airport with its facilities will be an excellent alternate for San Francisco International Airport. San Jose boasts of in excess of 95% operational weather.

For executive aircraft the Wright Brothers have a full maintenance shop for planes in every class. There are two radio shops on the field and an instrument shop.

The airport has mobile fueling trucks, rent-a-car agency, and a pilot's lounge with a weather recorder.

There is a cafe on the field which is in operation from 7 AM to midnight. The airport maintains taxi and runway lights all night long.

The present homing device is the San Jose TVOR on 108.2 mcs.—SJC.

San Jose's ILS installation should be in before spring.

According to Jack D. Harper, Operations Assistant. there will be a complete business flying center with facilities for executive aircraft.

The 1957 selection thus keeps the batting average of McClarren's committee in the top brackets. The group scored heavily last year when they came up with the name of Arthur Godfrey for the OX5 Award.

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cited for his longtime efforts to enthuse the public with the need for adequate airpower and, at the same time, get everyone into the air, either as a pilot or a passenger.

Now that we are getting many more people and planes into the air, the need arose for modern facilities to expedite air travel with safety. How to go about providing these facilities, was one of the main highlights of Mr. Curtis' findings while he was on special duty in Washington.

Business Planes Boom In Philadelphia

Activity at both city airports near Philadelphia is booming as a result of steady increases in business plane traffic according to the Commerce Department.

Traffic of "civil itinerant aircraft"—mostly business planes—went up 20% in May at International Airport compared with the same period of one year ending in 1956.

The increase of North Philadelphia Airport was 22%. There were 12,013 landings and takeoffs at Philadelphia International compared with 14,523 at N. Philadelphia. The Commerce Department is encouraging the location of new business in that area and they point out the convenience and flexibility of having quick transportation nearby.

The Texas Aeronautics Commission has suggested that all persons flying in the vicinity of Airspace Restricted Area 209 (White Sands) use extreme caution so as not to violate the restriction. Target seeking missiles are being tested which could endanger both aircraft and personnel. The Department of the Air Force has noted that test delays caused by unauthorized entries cost an estimated $40,000 per hour.

In Wyoming the county of Weston and City of Newcastle have restricted the use of their airports to aircraft weighing less than 12,500 pounds until extensive construction, now underway, is completed.

More Replacement Engine Parts To Be Available

Los Angeles. Approval for the manufacture of 16 additional replacement parts for Pratt and Whitney aircraft engines has been given to Civilair Engine Parts Corporation.

The parts are distributed through California Airparts Corporation and Air Aid. This brings the total of CAA approved parts manufactured by Civilair to 37.

San Diego. Waldo Waterman has designed a flying auto which may be the answer for the businessman on short-short trips. The machine weighs 1,000 pounds with wings and has an engine with 163 hp. The flying auto has detachable wings and will do 130 miles per hour in the air and 70 mph on the ground.

Man-Carrying Rockets To The Moon In Our Lifetime

Frank W. Lehan of Ramo-Wooldridge Corporation told members of the Los Angeles section of the Institute of Radio engineers that a man-carrying vehicle will reach the moon within our lifetime and an instrument-carrying vehicle will reach Mars sometime before most of us are under ye olde sod.

"I couldn't have given this talk five years ago. Achievements sounded a few years ago like Buck Rogers."

The rest of his discussion dealt with telemetry devices, tracking radars, landing aids, guidance systems and communications systems for space vehicles.

VTO Aircraft Coming Soon

VTO aircraft development is coming along at a rapid rate, according to Dr. William Bolly, President and Technical Director of Aero-physics Development Corporation at Santa Barbara, Cal.

The development of reliable VTO aircraft for business and commercial aviation may affect future American life as strongly as the automobile, he added.

Aerophysics, among others, is currently doing research into the possibility of such an airplane. Vertical take-off transports may open the three dimensional aerial medium for mass transportation, he said.

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Mobil's 'Copter

(*Continued from page 22*)

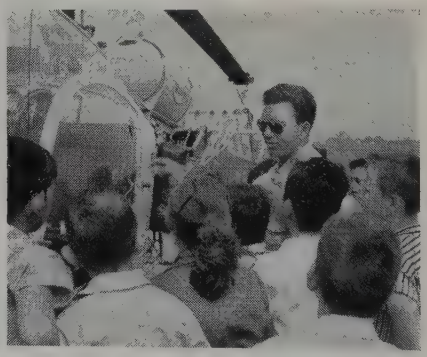
missions undertaken by Rhodes in Magnolia's Bell helicopter was a 52-hour ordeal in the wake of hurricane "Audrey." Magnolia placed its helicopter and pilot at the disposal of the rescue authorities. Rhodes first spotted the crew of a disintegrating offshore rig, and for the next two days, as coordinator of National Guard work under Lt. Col. L. E. Pauley, the helicopter was used to rescue the sick and wounded, airlift doctors and nurses, and to direct amphibious craft through the disaster area.

Rhodes has also brought out 33 medical evacuation cases from offshore rigs, many times for other companies. He has pulled hapless small-boat sailors out of the sea, searched for wrecked planes, and landed beside a tanker to take out a sick man.

One dark night a runaway bull rampaged onto the Beaumont airport. He couldn't be located, so all flights had to be suspended. At 3 a.m. Rhodes joined the search, soon located the critter and helped herd him off the airport.

That feat earned him a tongue-in-cheek certificate, with a gold seal and red, white and blue ribbons, from the Jefferson County Civil Defense administration. Rhodes, said the certificate, had fearlessly gone "beyond the call of duty and rescued a bull." But Rhodes also takes part in the deadly serious Civil Defense evacuation tests. In this role, mechanic Johnny Vaughan is the "casualty" and rides in a litter suspended outside the helicopter.

Such activities—and incidents like the rescue of the wounded boy in the bayous and the days of almost continuous effort after hurricane "Audrey"—have earned Magnolia's Bell a respected niche in the heart of the community. In fact, the diminutive whirlybird is about the only competitor of Magnolia's huge Beaumont refinery for the unofficial title of "Beaumont's First Citizen."



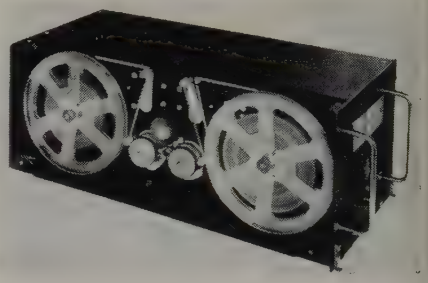
PARTICIPATION *in air raid drills and rescue missions has made the helicopter a "First citizen" of Beaumont, Tex. Here pilot Travis Rhodes explains his machine to a group of 4th graders. A healthy interest in flying is one sound way of avoiding juvenile delinquency.*

Music Relieves Tension

(*Continued from page 42*)

now use the background music service. Nearly every major airline uses it or has ordered its installation in jet aircraft. Many lines report its usefulness. One study, by Braniff, indicated the music cut confusion and caused passengers to settle down in their seats faster during boarding. Seaboard & Western has found the music quiets children—and their mothers—on flights of Army dependents to Europe. Western Airlines uses music to lend an air of luxury to its "Californian" flights as hostesses pour champagne and dispense orchids.

Generally, the programs are tailored to the needs of subscribers. National Airlines "Star" flights, for example, feature Latin rhythms on trips to Cuba. Pan American and United use Hawaiian selections on their flights to the Islands. These are but a few of the airlines using functional music to meet specific needs.



TAPE-RECORDED *travel music comes from this 28-lb. player, goes to passengers through the public address system. Unit is built to ARINC specs to fit in standard ATR racks, measures 21 x 10½ x 8".*

The latest business user of "Travel Muzak" is Union Bag-Camp Paper Corp., Franklin, Va., which has installed it in a DC-3 for executive use. The music is available in reels of prerecorded tape which play up to three hours without repeating. The tapes are played by a shoe-box-sized unit built to ARINC specifications and designed to fit in conventional ATR racks. Of heavy-duty construction, it weighs only 28 pounds, and is capable of long, unattended service operated by a remote control switch. It feeds the music signal through the plane's public address system to passenger seat areas.

Pilot's Eye

(*Continued from page 46*)

McMillan radomes are produced in compliance with applicable Military Specifications under process specifications approved by the Air Force and the Civil Aeronautics Administration. Radome kits developed for use on civil, corporate or commercial aircraft have been issued a Supplemental Type Certificate prior to being released for distribution. These parts are produced under the provisions of a Parts Manufacture Approval which serves to assure

the operator of a part not only electrically qualified but structurally proven and approved for his aircraft. Radomes not produced under this system are accompanied by a complete structural analysis and substantiation of manufacturing integrity to assist the modifier in certificating the installation. Still other products are certified by other qualified agencies such as Great Britain's Air Registry Board and are recognized by CAA as being airworthy.

The majority of commercial radar sets in operation today utilize a rotating antenna which scans 360°. This means that through approximately 120° of the scan, the antenna is "looking" at the aircraft itself. All of this stray microwave energy is useless for radar presentation and may be detrimental to the physical well-being of any crew member continually exposed to it; therefore, it must be diverted, absorbed or otherwise disposed of.

Microwave absorber material has been developed in many forms, one of which is a thin blanket designed for airborne application. Installation of the Type T microwave absorber can be seen in the bulkhead of the DC-3 in the photo. This absorber is available in either sheet form or in preformed bulkheads designed to fit the bulkhead station immediately behind the antenna. As the name implies, this absorber "absorbs" radar energy directed toward it and prevents penetration to the airframe or to personnel otherwise in the path of a powerful electronic signal.

Although radomes come in various shapes, the aim is the same for all . . . to avoid weather by "seeing" it before flying into it.

Medical Examination

(*Continued from page 40*)

an adequate examination can be done in much less time. The cost will vary from place to place, but should not exceed one hundred dollars. Three hours and one hundred dollars is a small price to pay for a longer life, more time flying and safer flight operation.

The following is a list of the things I believe should be done. The required C.A.A. examination is a big step in the right direction, but for your own personal health you should seek an even more extensive examination. These should be performed annually.

1. Inventory of symptoms by systems and a history of any present or previous illness.
2. Detailed and thorough physical examination.
3. Personality analysis by the examiner.
4. Proctoscopic examination.
5. Audiometric (hearing) examination.
6. Electrocardiogram. Every six months for those who show minor progressive changes.
7. Chest X-Ray for heart size and chest disease.
8. Complete blood count, urinalysis, sedimentation rate, blood urea nitrogen, non-fasting blood sugar, blood cholesterol, and blood serology determinations.

The two prerequisites of good health are: one, proper living habits to maintain physical and mental well-being and two, early recognition of disease processes so that corrective measures may be taken to restore good health. This is the opportunity being offered the pilot today. ✝✝✝

CAB Guarantees Loans For Local Service Carriers' Equipment

The Civil Aeronautics Board can now guarantee loans up to $5,000,000 for new equipment purchased by local service air carriers.

The plan is in an Act, proposed last spring and signed September 7 by President Eisenhower, designed to assist the local carriers in replacing their present old and uneconomical aircraft with new and more efficient equipment.

The new Act authorizes the Board to guarantee loans up to $5,000,000 per airline after approval of loan conditions. In no event can the guarantee exceed 90% of the loan, and the provisions of the Act expire in five years.

Inquiries may be made to Sam I. Aldock, assistant director, CAB Bureau of Air Operations.

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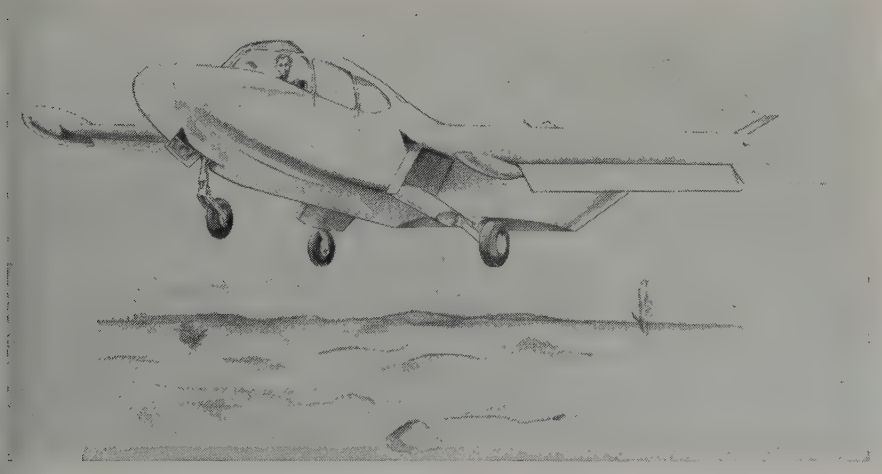

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AERIAL ACROBATICS

To Alford Joseph Williams Jr., a naval aviator and test pilot, goes credit for having developed to a fine art, the aerial acrobatics used in air combat. His interest was in acrobatics and speed. In 1923 he set a record of 266.59 m.p.h. winning the Pulitzer Trophy for that year. As one of the early test pilots he contributed much to commercial aviation.

Another contributing factor was the stabilizing influence of "aviation insurance" pioneered in 1928 by the United States Aircraft Insurance Group to bring financial relief to a heavily burdened industry.

Now expanded to over 60 member companies, this same "U. S. Group" still serves the aviation market as it has continually for the last quarter century.

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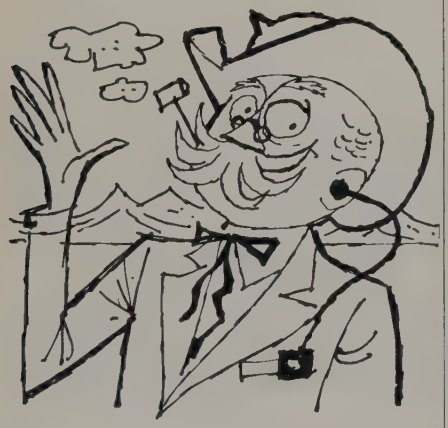

Cap'n Sharp Says:

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Vertol's Flying "Horse" Goes to Work for Business

Vertol Aircraft Corporation of Philadelphia, producer of the H-44C Helicopter, has signed a contract with Reading Aviation Service, Inc., Reading, Penna. for the prototype conversion of the H-44C for executive use.

Normally in production for the armed forces, the ship will be completely fitted with a plush interior to accommodate 10 passengers, including crew.

This helicopter was recently certificated by both CAA and Canadian ministry for commercial use in three versions: (a) Cargo—with useful load of 2.5 tons, (b) Airliner with 19 seat capacity, and (c) the executive version.

Reading Aviation working in cooperation with Paul Zimmerman, aircraft interior decorator of New York, will install a plush cabin interior. Details have not yet been finalized but will include five reclining swivel chairs, one 2-place divan, secretary's desk ad chair, stewardess' jump seat, powder room, bar, wardrobe, and broadloom rug with foam rubber underlay. Color scheme will be two shades of tan, gold, and gray.

Aircraft will be in work approximately five weeks, after which it will tour the U. S. on display.

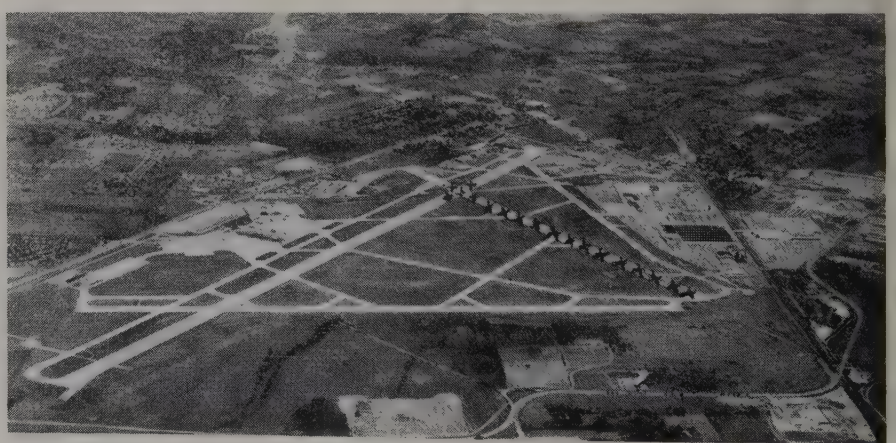
Notice on Magneto Adjustments

Airwork Corp., Millville, N.J., has issued a bulletin concerning the proper point adjustments on Bosch and Scintilla magnetos in the field.

Bosch: With cam follower on highest position of #1 lobe (lobe with red dot), breaker-point opening should be minimum of .009 inch and maximum of .010 inch: anything less than .009 requires adjustment of points. *Under no circumstances should position of breaker plate in breaker compartment be changed.*

Scintilla: Breaker points on these are not set for any fixed clearance at full open position. Clearance will vary greatly in different magnetos. When it is necessary to change point setting or to replace points in Scintilla, follow the applicable Scintilla Service Instruct.

E. D. MORENO, *General Manager of AIRotary Supply Co., Inc., Sun Valley, Calif. AIRotary sells, overhauls and services inverters, dynamotors and alternators of all prominent makes and is conveniently located to serve all western business pilots.*



THE 6000' *instrument runway at Lambert-St. Louis Municipal Airport, indicated by checks, soon will be covered with a concrete overlay 8-10" thick. A portion of the runway, built in 1941, has held up well despite an increase in the weight and volume of traffic.*

New Oversize CKL Blind Rivets

Huck Manufacturing Co., Detroit, Mich., is producing new oversize Conical Keystone Lock (CKL) blind rivets, 1/64-in. oversize on diameter, to insure hole filling and produce a good tight installation in dimpled sheets. They are available with counter-sunk head style; sizes include 1/8-in., 5/32-in., and 3/16-in. oversize sleeve diameters.

Free-Wheeling Attachment

Proto Tool Co. has introduced a "Rotahead" Free-Wheeling attachment which makes any half-inch drive handle, extension or torquer instantly reversible.

To change direction, the head is merely pressed down; 30 teeth then engage, for heavy torquing capability.

Take-Off Aids

(*Continued from page 24*)

keep in mind: First, a line speed of 140 knots as he passes by the 2,000 foot marker, a refusal speed of 153 knots and a lift-off at 173 knots.

At first glance this does not appear to be difficult. However, the time interval existing between a line speed of 140 and a refusal speed of 153 is only 1.8 seconds. The time interval between refusal and take-off speed is 2.7 seconds. It is this short time difference between the line and refusal speeds which is the critical item for the take-off. Eighteen and one half seconds after the pilot releases the brakes the aircraft should pass the 2,000 foot markers. At this point, the pilot must identify the marker as it passes to one side and simultaneously read the indicated airspeed and decide whether or not his speed is at or above the 140 knot figure. If there is any doubt in his mind about this assessment, he must act in 1.8 seconds if he is to stop on the concrete. Shortening the runway serves to make this time difference shorter. To make the refusal speed equal to the take-off speed, a runway length of slightly over 10,000 feet is required for this aircraft.

It is clear that this procedure is actually beyond the capability of even seasoned pilots, considering that it requires a precise judgement at a unique point on the take-off, and that three separate speeds must be remembered. Also, these speeds are variables which change for each gross weight, aircraft configuration, runway, and atmospheric condition.

The requirement for the development of instrumentation to assist the pilot in evaluating take-off performance has been generated largely through the efforts of the Directorate of Flight Safety Research. The Sperry Gyroscope Co. is pursuing the investigation of a "take-off monitor" instrument. This program is presently under the cognizance of the Flight Instruments Laboratory at Wright Air Development Center.

History of Take-Off Aids

Until recently, take-off aids have dealt with the determination of proper or normal power plant performance. This goes back to the early days of aviation, when an RPM indicator for the engine was first installed. As the reciprocating engine developed, and the constant speed prop and superchargers came into being, the manifold pressure gauge was added. A big step forward occurred with the introduction of BMEP or torque meters, which gave a direct output of a torque of reciprocating engines. There was a device marketed a few years back which sensed the impact pressure behind the propeller and compared this to the aircraft impact pressure, thus providing a direct indication of power output through the propeller. This same general pattern has been followed in the case of jet engine which originally started with RPM and tail pipe temperature. Then followed pressure ratio gauges, compressor outlet pressure gauges. Many attempts to obtain gross thrust indications through strain gauges or other techniques have been made. None of these are operational at this time, to my knowledge.

The major limitation of thrust or power measuring devices, as far as the take-off is concerned, is that they do not measure the over-all take-off performance. They do not reflect the drag or thrust-countering elements in the take-off. For this reason, the take-off has always been, in servo terminology, an open loop operation. The pilot takes off because the handbook says it can be done. As his experience in flight in the particular aircraft type increases, this loop begins to close, in that he can begin to assess the take-off performance in terms of acceleration and distance utilized along the runway. This is the root of the problem in the jet aircraft since the take-off performance varies widely and pilot's experience can lead to mistakes in judgement.

There have been airfield developments which were not intended to be used as take-off aids, but which nevertheless can contribute in preventing errors in judgement by reducing the anxiety of the pilot on any given take-off. These airport type developments include water troughs or barriers which can minimize the consequences of overrunning the end of the runway on an aborted take-off.

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performance, a recent successful instrument of this type was constructed by the NACA a few years ago. A description of this instrument may be found in the NACA Technical Note 3252, entitled "Description and Preliminary Flight Investigation of an Instrument for Detecting Sub-Normal Acceleration During Take-Off." This instrument combined barometric and accelerometer elements in such a way that the indication on take-off could be predicted and displayed as a constant deflection of a pointer similar to an airspeed pointer. This instrument operated on the principle that the sum of the longitudinal acceleration and a constant times the impact pressure remain constant during the take-off. The equation for this instrument was:

$$\frac{a}{x} + \frac{q}{W} {}^{f}DE = \text{constant}$$

where:

a_x = longitudinal acceleration
q = dynamic pressure
W = gross weight
${}^{f}DE$ = effective drag area of the aircraft including factors to account for variation of thrust and friction with increasing speed, as well as aero dynamic drag.

$${}^{f}DE = CDS - \mu CL + \frac{dT}{dq}$$

CD = drag coefficient
S = wing area
μ = friction coefficient
CL = lift coefficient
$\frac{dT}{dq}$ = rate of change of thrust with q.

This experimental indicator responded quickly to changes in thrust simulating partial power failure. A more advanced instrument which would permit the selection of varying take-off conditions is currently in work with the NACA. The NACA instruments display information as to whether or not the aircraft is accelerating normally on the take-off in accordance with the handbook. From an operational point of view the pilot must set into the instrument a gross weight and some index which is obtained from charts similar to the existing take-off charts.

Requirements for a Take-Off Monitor

Analysis of the requirements for a "take-off monitor" indicate that the following questions are significant.

1. Is the take-off proceeding normally?
2. Will the take-off be effected on the existing runway if a sub-normal acceleration is experienced?
3. Can a safe stop on the runway be effected?

Of these three questions, obviously the first is of greatest interest to the pilot. It appears likely that the most useful display of this information should be continuous, and should be in a form similar to that used in the NACA instrument, available for reference from the time the brakes are released until the wheels leave the ground. Point checks of the same type as the present line speed check should be avoided because of the possible conflict with some control requirement that may coincide at the time when the check should be made. Recalling the times of the example take-off, the take-off time was 23 seconds with 20.3 seconds elapsing to the refusal speed distance. A continuous display for this interval of time obviously gives the pilot the maximum amount of anticipation for a possible abort.

The second question, "Will the take-off be effected?" becomes of primary concern to the pilot when some partial power loss occurs during the take-off roll. Questions as to whether the aircraft can take off on the runway at all, assuming normal performance, should obviously be determined prior to climbing in the cockpit. The partial power loss problem is probably one of small consequence statistically, since the partial power loss can occur prior to reaching the safe stop point, as well as later. If it occurs prior to the safe stop point, obviously the instinctive decision would be to stop the take-off. If the power loss occurs after the refusal distance has been reached, it is quite likely that the pilot will be unable to evaluate properly a display which will tell him whether to continue the take-off or not.

The third question, "Can a safe stop be effected?" is obviously one of considerable interest to the pilot, but in the case of a total engine failure, the safe stop distance question for the fighter is academic. The aircraft is going to come to a stop in any event. The option for flight doesn't occur.

In the bomber case, questions 2 and 3 may take on increased significance when nuclear weapons are being carried. But again the question of "Should I continue or should I stop?" becomes a difficult question to expect the pilot to answer at such a critical time. It may well be that the risk of an overshoot on an aborted take-off where nuclear weapons are involved, may require automatic treatment of the decision to continue or to stop.

Considering the design requirements for the take-off monitor, there is the choice of relying upon manual computation in the briefing room with minimum settings or inputs to the instrument in the aircraft, or a more automatic computer taking into account the various variables which determine the take-off performance. Given any particular aircraft, the take-off performance is a function of 1) gross weight, 2) pressure altitude of the runway, 3) temperature, 4) runway gradient, 5) aircraft configuration, 6) wind and 7) the thrust configuration. A fully automatic computation of 1) take-off acceleration or 2) variation of speed as a function of distance or 3) speed as a function of time is quite complex. It appears more practical to have the pilot enter take-off performance charts to obtain reference values which can be set into a simpler instrument, rather than attempting to build an airborne computer which can accommodate all variables.

The success of a take-off monitor instrument is heavily dependent upon pilot acceptance. The influence of reliability here is obvious. Accuracy requirements are difficult to define, but certainly the instrument must be sensitive enough and have sufficiently high response to indicate quickly a slight closing of the throttle. This will undoubtedly be the first thing a pilot will try in order to see if the instrument works. The space and weight problems, of course, are always with us. The retrofit possibility seems to point to a re-

placement for some existing instrument, or else a very small component.

From a display or information transmission point of view, it appears to me that the minimum requirement for a take-off monitor is the comparison of the acceleration of the aircraft, with some predicted acceleration, as a function of time. The technique of solving this particular problem may make use of accelerometers or various speed or distance measuring devices, for example, wheel revolution counters.

A variety of possibilities exists. From the pilot's point of view, it seems to me that the most desirable type of display is one which shows this acceleration performance compared with a predicted value. The display should be substantially static. In this way it is consistent with the engine instruments of all types which we have used for many years. There are display possibilities which involve moving pointers. These may display distance, or a required airspeed element which is matched against the moving airspeed pointer. However, displays of this type are complicated to build and are subject to inevitable criticism by pilots who hate to see the airspeed indicator clobbered up with some new and, as yet, untried piece of equipment. An argument leading to a separate indication is that a take-off display is definitely a special purpose piece of instrumentation. It has its place in the take-off but is unused during the rest of the mission. It portrays vital information, but information which is actually only of brief significance as far as the over-all mission is concerned.

The next most critical piece of information is the stop distance. Our present operating procedures certainly indicate this concern. However, the stop distance problem is more complicated technically than the take-off since surface conditions of the runway such as rain, snow, asphalt or concrete can appreciably affect the stopping distance of the aircraft. Here, a simple go/no-go indication seems sufficient. On the take-off the pilot has only committed himself after he has proceeded beyond the refusal point. Of course, if a stop computer could display continuous information, in the same fashion, as is suggested for the take-off, it could be used to warn the pilot that he is not using maximum braking or is not utilizing the maximum stop performance. However, with anti-skid brakes in common use, the necessity for this type of indication seems slight. If this display could be somehow related to the landing, the requirement might be different. However, this is a problem beyond the scope of this article.

Conclusion

The Flight Safety Research statistics have shown a real requirement for over-all take-off monitoring instrumentation in order to assist the pilot in evaluating his take-off performance.

Such instrumentation should provide a continuous display of the take-off performance starting at the point of brake release. This display should be of an essentially static pointer type of indication. Of slightly less importance is a stop distance warning system. This display can be of a go/no-go type of indication.

Take-off monitor instrumentation should reduce the incidence of accidents caused by erroneous judgement of the pilot during take-off by providing him with an over-all performance index.

Short Blasts

Boeing is considering building a small jet, conceivably for business flying, to be called the Model 727.

AC Short-Reach Spark Plug Chart Is Available as Reference Guide

The AC Spark Plug Div. of Gen. Motors is now offering a specification chart for AC short-reach plugs, both massive and fine wire electrode.

The multi-colored chart shows the AC type and gap specified according to air frame and engine model, for aircraft employing short-reach plugs.

It is available through AC distributors and dealers, or direct from AC's Flint, Mich. headquarters.

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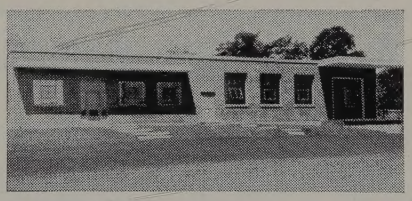

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NU-AVI-QUIP

Miniature RF Cable Connectors

A new, sub-miniature series of RF coaxial cable connectors has been introduced by Dage Electric Co., Inc. The series includes 12 different groups of jacks, receptacles and adapters.

These "DM" connectors can withstand a cable-pull of over 50 lbs., despite small size. 12 polarities, one for each group of connectors, prevents possibility of wrong connections. Assembly requires no crimping tools.

Mobile Generator Plant

Pioneer Gen-E-Motor Corp., has developed an electric generator plant which is unusually mobile.

The unit is mounted on a frame and dolly, supported by rubber-tired wheels, with a hand-guide.

The generator provides an output of 2300 Watts, 115V AC, 60 cycle, 1-phase. It also provides an output of 12 V DC at 200 Watts for battery charging.

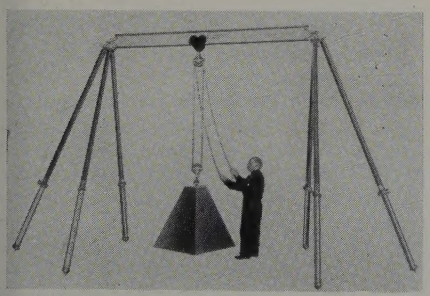
Light-Weight Cabin Amplifier

An aircraft cabin amplifier weighing less than three lbs., and measuring only 3 x 7 x 3 inches, has been developed by Aircraft Radio Div. of Transval Engineering Corp.

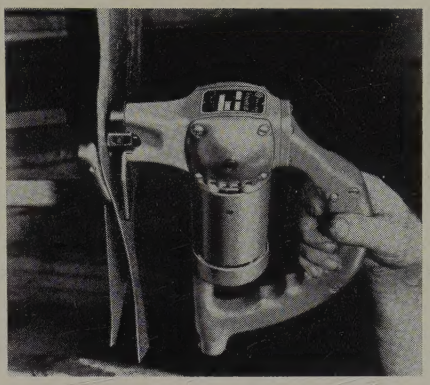
Designated the TCA-10, the unit is completely transistorized. The components are sealed against moisture and dust, and lifetime transistors are used.

Magic-Pole Floating Gantry Now Produced by B. E. Wallace Products

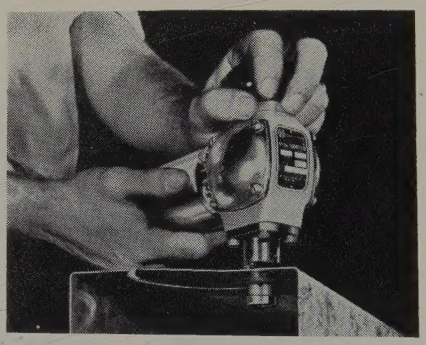
An adjustable-height gantry, light enough to be erected anywhere by 2 men is now being produced by B. E. Wallace Products Co., Exton, Pa. Maximum height is over 14 feet. The legs have 6-foot adjustment, permitting setups over high obstruction, or where



headroom is low; or in cramped quarters where equipment, pits, platforms, etc., require a different adjustment for each leg. The sturdy I-beam is of aluminum alloy, is 10-feet long, weighs 65 pounds. Each of the end supports is a complete tripod, removable from the I-beam in seconds and usable as a conventional tripod. Easy hauling and compact storage are added features.



NEW NO. 16 SHEAR, *made by Black & Decker, Towson, Md., makes fast, easy cuts in all types of sheet metal and wire netting. Exclusive deflector-plate on shear prevents curling; eliminates possible fouling.*



NEW BLACK & DECKER NO. 16 NIBBLER, *Tool is fed along cutting line; punches small rectangular pieces from material being cut leaving perfect, smooth edge, without bending or curling material on either side.*

Underground Pumps for Fuel

The Reda Pump Co. is now making submergible pumps designed to handle aviation fuel from underground storage tanks, without above-ground installations.

According to the co., the pumps have these advantages: no vapor locks; no stuffing boxes; no explosion hazards; no horsepower or pressure limitations.

Liquid Level Sensing System

Simmonds Aerocessories, Inc., is producing a line of liquid level sensing systems which can operate a light to show the level of liquid, or can actuate a control to start to stop pumps; or may be used to operate valves to transfer liquid from one tank to another.

The system operates in aircraft fuel; Skydrol; aircraft and jet engine lubricating oils, and other hydrocarbon liquids. It can also be designed to handle liquified gases.

The system is shock-resistant, has no moving parts, a low power consumption, and can be ac or dc powered.

Cluster-Arm Miniature Switch

A new, miniature switch, with a multi-finger silver-alloy cluster arm attached to the rotor, has been released by the Shallcross Mfg. Co.

The basic 24 or 32-finger cluster assembly may be supplied in various configurations to meet differing needs.

Among possible applications are: for engine analyzers, or radio frequency selectors.

Improvements on Dynamotors

A series of lightweight, compact dc-to-dc power converters is now available from UAC Electronics.

These transistorized units are reported to be improvements on heavier, less efficient dynamotors.

Standard units are available for 12 and 28 volt inputs, in a number of output voltages from 120 to 2100 volts, and in power output up to 500 Watts.

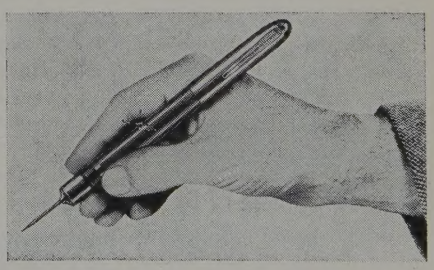
New Emergency Escape Light

A new Micro Switch emergency escape light, designed to meet new CAA requirements governing emergency lighting, is being marketed by Micro Switch, Freeport, Ill., div. of Minneapolis-Honeywell Regulator Co. Light employs a new precision inertia switch that turns the lamp on automatically, reliably and without attention. Severe jolts or impacts in any horizontal direction operates the inertia switch; once actuated, the light stays on until turned off with reset button.

Four standard flashlight cells and a sealed-beam lamp make up the unit; the reflector is part of the sealed lamp unit. It is available in two models: a portable, which has a quick release lift-latch; and a flush-mount model which mounts flat to the bulkhead.

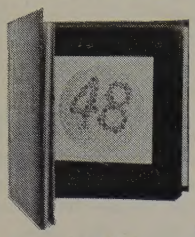
New Precision Oiler

A new precision-made oiler, designed like a fountain pen to deliver amounts of oil as small as a fraction of a drop, is now available from Dill Mfg. Co., Cleveland, Ohio. The unit eliminates



waste and mess; operates in holes up to 7/8-in. in depth and other places difficult to reach; can be used vertically or horizontally for holes and surface application. Oil supply is visible in a transparent reservoir; one filling provides a long-time supply.

1-MINUTE TEST
For Color Blindness



Famous Dvorine Pseudo-Isochromatic Plates* offer positive 1-minute test for color blindness. 23 color plates & color wheel. No training required; results are self-evident. Send for free descriptive folder.

The Dvorine Color Vision Test is acceptable to the Administrator of Civil Aeronautics as a test of Color Vision in Civil Airmen.

Set: $15
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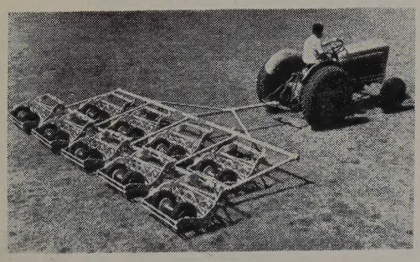
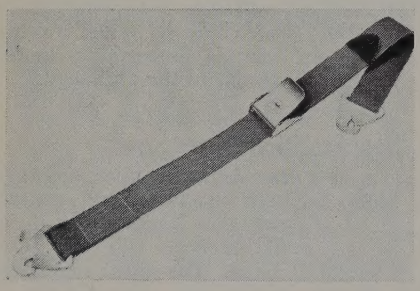
New Airfield Mower Available

Roseman Mower Corp. has announced its new, 21-ft. cutting width Airfield Gang Mower, available in 3, 5, 7 and 9 gang sizes.

The rear-drive design of the mower permits working close to fences, hangars, etc., and the heavy-duty construction (including such features as laminated, no-air tires that are puncture-proof) assures trouble-free service, the manufacturer states.





MODEL *M-7500 nylon-rayon seat belt by Air Associates features maximum grip with simple foolproof buckle. Flame and soil resistant, mildew-proof, the belts are available in six standard colors which match most business aircraft interiors.*

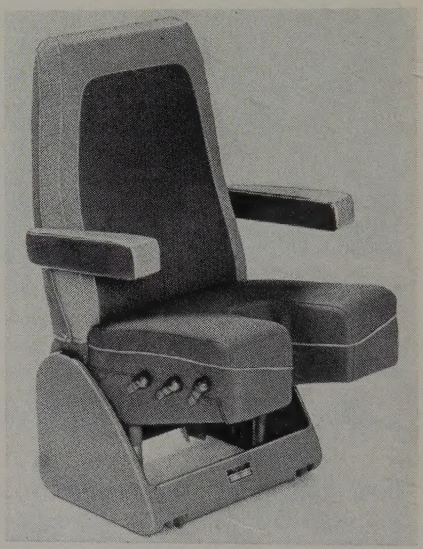
New Janco Line of Bus Assemblies

Janco Corp. of Burbank, Calif., long-time producers and developers of many items in the electrical and electronic fields, is now designing and manufacturing a new line of Bus Assemblies to existing AN and Aircraft Specifications. Silver brazed, tinplated copper flag terminals are swaged to cable at required spacing and re-plated after assembly to assure maximum protection. Flexible bus assemblies are available bare or protectively sealed with vinyl, nylon, neoprene or silicone coating. The flexible type construction permits maximum maintainability of electrical systems such as switches, circuit breakers, fuse blocks or wherever a gang installation is required.

Rigid bus blocks are available in cadmium or silver plated copper or bare aluminum as called out on specification AN 3433 and NAS-44.

Janco's Rotary Selector Switch #1208 mechanism can be made to accommodate requirements for break before make, make before break or combinations of these. Duty life cycle of the switch will operate at 10,000 double cycles minimum with a torque of 11 inch-pounds maximum.

Additional features include isolated position #1 and #9 which are activated by depressing the knob and positioning to the isolated section. High-temperature operation includes continuous rating at 250 degree F., appreciable periods at 300 degrees F., and intermittent periods at 350 degrees F.



PILOT *and crew seats now in production by Weber Aircraft Corp., Burbank, and designed by Walter Dorwin Teague, are built to rugged specifications, but conserve weight in material and design. Originally designed for the Boeing 707 stratoliner, corporation pilots would be interested in something as comfortable as this.*

New Seal Features Taper Pin Design

A new glass-to-metal seal with terminals or leads designed to match standard solderless type connectors is now being offered by L. L. Constantin & Co., Lodi, N. J.

The special tapered pin or tab can be specifically designed to mate with female lugs or connectors where solderless connections are required. The seal is adaptable for relay manufacturers or those involved in harness work.

Polyester Plane Skis Weather Arctic Storms

Skis for light aircraft, said to be the first constructed entirely of fiberglass-

reinforced polyester, are manufactured by Airglas Engrg. Co., Anchorage, Alaska.

Overall performance of the Landes Fiberglas Aircraft Ski, which has been in production for 2 years, is said to have proven excellent under severe arctic conditions.

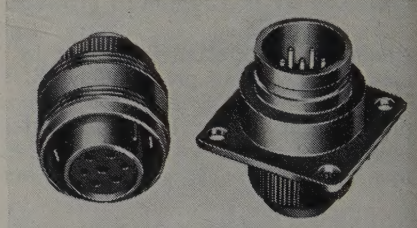
Use of polyester construction provides high impact strength, to permit the CAA-approved skis to resist cracking under high shock loads, according to the manufacturer.

The lightweight skis are offered in 4 sizes. They are reported to have exceptional weather resistance to eliminate freeze-down and sticking under varied snow conditions, to require minimum maintenance. They are also said to have exceptional deep-snow performance characteristics.

New Series Connectors Offers High Vibration Resistance

A new "Q" Quick-Disconnect series is announced by Cannon Electric. Environmental resistant features are reported to make the connectors ideal for aircraft applications.

The new line is available in 3 sizes, one a square-flanged receptacle, the second a hermetically-sealed round-



flange receptacle, and the third a straight plug.

Resilient grommets are incorporated on the first two models for sealing of different O.D. wire sizes from .050 to .105. In addition, the receptacles have a rubber sealing ring that is located just forward of the insert face, to effect a complete seal around the barrel of the plug.

A copper latch contained within the plug coupler assembly slips into grooves around the receptacle, to provide a mated connector that resists vibration without the use of a safety wire.

Second G.M. DC-3

Minneapolis, Minn. General Mills Corp. has purchased their second executive DC-3 aircraft for all-weather transportation. The conversion work was done by Remmert-Werner.